



NAME OF AUTHOR/NOM DE L'AUTEUR LOWELL D. PHILIP

TITLE OF THESIS/TITRE DE LA THÈSE A DISCERNMENT OF ULTIMATE
CONSUMER AND INDUSTRIAL BUYER ATTITUDES
TOWARD PRINT ADVERTISING.

UNIVERSITY/UNIVERSITÉ U. OF ALBERTA.

DEGREE FOR WHICH THESIS WAS PRESENTED/
GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE M.B.A.

YEAR THIS DEGREE CONFERRED/ANNÉE D'OBTENTION DE CE GRADE 1975

NAME OF SUPERVISOR/NOM DU DIRECTEUR DE THÈSE DR. RONALD SAUVE.

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THE UNIVERSITY OF ALBERTA

A DISCERNMENT OF ULTIMATE CONSUMER AND INDUSTRIAL BUYER
ATTITUDES TOWARD PRINT ADVERTISING

by



LOWELL D. PHILIP

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE

EDMONTON, ALBERTA

SPRING, 1975

THE UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies and Research,
for acceptance, a thesis entitled A DISCERNMENT OF ULTIMATE
CONSUMER AND INDUSTRIAL BUYER ATTITUDES TOWARD PRINT ADVER-
TISING submitted by Lowell D. Philip in partial fulfilment
of the requirements for the degree of Master of Business
Administration

Ronald Savitt
.....

Supervisor

Heile A. Brown
.....

V. B. K.
.....

Date . . . April 28, 1975 . . .

Abstract

The study provides a fuller understanding of ultimate consumers and industrial buyers. This knowledge is used to add to the basics of advertising theory.

Marketers do not use reliable methods to determine advertising effectiveness. An alternative is proposed to the traditional recall, playback and observation tests.

Ultimate consumers and industrial buyers are compared on the basis of their attitudes toward print advertising. Forty people in each group were shown three advertisements for the renting or leasing of paintings. Each advertisement stressed a different appeal - "emotional", "rational" and "neutral". The respondents answered six bi-polar scales with respect to the test advertisements and were asked two open-ended questions about print advertising in general.

The variance between groups was analyzed both visually and statistically. It was found that in advertising for similar goods both ultimate consumers and industrial buyers prefer neither a totally "rational" nor a totally "emotional" appeal. A combination of the two appeals was found to be optimum.

Advertisers will be aided in designing more effective messages by implementing similar tests to measure the attitudes of their audience instead of the traditional ineffective methods now used.

Acknowledgements

I would first like to thank Dr. Ronald Savitt for his kind assistance and supervision of this thesis. Our many discussions and his timely comments during class were a great help in developing the research. Dr. Sheila Brown and Professor Peter Bartl contributed very special information and direction which made my task much easier. It was most enjoyable and rewarding to have worked with these three special people.

I am grateful to Dr. Dave Jobson for his many explanations of the various computer programs. My thanks go to both the Department of Art and Design, for permitting me to use the typographic and photographic facilities, and Frame Craft 7711 Ltd., the nice people who allowed me to photograph the picture frames in their gallery. The typing of the final draft by Mrs. Anne Knutson is much appreciated.

The generous financial assistance received from my parents, Bob and Rose Philip, is most gratefully appreciated. My thanks are due to them for their help in this endeavour.

My special thanks go to my fiancée, Glenda Clark, for her continued encouragement and bright outlook for the results.

If it were not for the eighty men and women who cheerfully entertained my intrusion into their busy day, this thesis would not have been possible. I enjoyed meeting them all.

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CHAPTER 1

INTRODUCTION

The General Problem

The purpose of this study is to develop an understanding of ultimate consumer and industrial buyer attitudes toward print advertising. This is an important area of study for two reasons. First, most research which has been undertaken in consumer behavior has concentrated on ultimate consumers. That is, those consumers who purchase goods for their own personal consumption, such as for household use. Little basic research has been undertaken on the behavior of industrial buyers, or those people who purchase goods for consumption or resale by firms. There has been an even smaller portion of research into the similarities and/or differences between these two groups. Thus, it is valuable to improve our understanding of the roles of both groups. This process can be aided by examining their attitudes on one variable which influences them, that is, the advertising they are exposed to. Secondly, advertising is perhaps one of the most criticized areas of marketing. It is most disturbing, as marketers, to find that much of the criticism is well justified. There is a need for marketers to develop a more basic understanding of their target audiences. More than just advertising research must be undertaken-- there is a need to engage in basic attitude research in the

field of mass communications. The traditional advertising approach, for both ultimate consumers and industrial buyers, seems to require some very basic alterations.

A study of the attitudes toward print advertising will help to provide better insights into the responses of the two groups and improve upon the basics of advertising theory.

Background to the Problem

Perhaps the most fundamental reason a problem exists, is because of the traditional distinction made between ultimate consumers and industrial buyers by advertisers.

The traditional view of the industrial buyer is that of a cool-headed businessman taking rational decisions based on hard facts in order to improve the profitability of his company. In contrast to this picture of rationality can be presented the actions of possibly the same man, or at least his wife, as a member of the consuming public open to impulse purchase and swayed by the emotional appeal of advertising.¹

The principal reason for this view being held by advertisers is well stated by Bauer.

The study of communications has traditionally (though not exclusively) been conducted from the point of view of the effects intended by the communicator. Viewed from this perspective, the disparity between actual and intended results has often been puzzling. The key to this puzzle has come increasingly to be seen in entering the phenomenal world of the audience and studying the functions which communications serve for him. The big failure in communications research to this point has been that the audience has not been given full status in the exchange relationship; his intentions have not been given the same attention as the intentions of the communicator.²

Thus, it is important to develop a full understanding of the audience in the communication process to provide the means for taking a "second look" at the traditional view of appeals in advertising theory.

"To view the industrial buying process as completely objective and rational is to ignore the essential fact that industrial buyer-seller relationships involve interaction among people."³ Also, to view the ultimate consumer buying process as completely subjective and emotional is to ignore the essential fact that ultimate consumer buyer-seller relationships involve many purchases which require objective evaluation.

The above statements provide the basis for answering the following questions: Do industrial buyers react to rational appeals alone in the advertising to which they are exposed for industrial goods, and do ultimate consumers react to emotional appeals alone in the advertising they are exposed to for goods for their own personal consumption?

Rationality is defined by the individual's decision model. Thus, all persons do not assign the same meaning, in rational or irrational terms, to a specific appeal. What is rational for one person may be irrational for another.

Therefore, as a guideline to this analysis, the terms "rational" and "emotional" are understood to mean the following. A rational appeal is one where the evaluation

uses objective criteria whereas an emotional appeal is evaluated using subjective criteria.

Nicosia (1966), defines consumer behavior as "the result of an interaction between external and internal stimuli and between rational and irrational orientations".⁴ This definition applies equally well to ultimate consumer behavior and industrial buyer behavior. It is not the purpose of this study to analyze in detail the decision-making processes nor the various models of consumer behavior of the respective groups. It is, however, valuable to the understanding of the problem to analyze the factors which influence the two groups in the context of a two-way communication process.

The communication process which best provides a guide for examining the various influences on purchasers, is the "phenomenistic approach". The basis of this process is that it is an extension of the "direct effects model", in which only the effects intended by the communicator are considered (the traditional approach). It also refines the approach of the "two-step model" where the consumer seeks consistency with an opinion leader. The phenomenistic approach "portrays individuals as bringing something to communication situations, that is, as being active participants in communication".⁵ As long as this approach does not consider media as being a weak influence in the communication process, it is entirely consistent with

Nicosia's definition of consumer behavior.

The selective exposure to, perception and retention of communication stimuli by purchasers are a result of the interaction between external and internal stimuli and the criteria for the degree of rationality stipulated in each environment by the receiver. To fully understand the audience will help to predict the degree of audience participation that will result upon the exposure of a specific message.

Influences on the Purchasing Decision

Webster and Wind (1972), have outlined four factors for the industrial buying context. However, a good understanding of the similarities between industrial buyers and ultimate consumers is obtained by considering the four factors in both environments. The four main factors which influence purchase decisions are, 1) environmental factors, 2) organizational factors in the industrial context and "family" factors in the ultimate consumer context, 3) interpersonal factors, and, 4) individual factors. All four factors are stimuli which determine the degree of rationality with which a person is oriented. The first three factors are external stimuli and the fourth factor is the internal stimulus. It is the interaction of the internal and external stimuli with reference to the rational-irrational orientations which Nicosia implies to

determine consumer behavior. Webster and Wind suggest considering both "task" variables, or those which are directly related to the buying problem and "nontask" variables, or those which are not directly related to the buying problem.

Each of the four main factors is now briefly considered.

Environmental Factors

The specific political and economic characteristics of society which apply directly to purchase decisions are important factors. These task variables are as important to ultimate consumers as they are to organizations. They provide guidelines for the purchase decisions which are considered. In the industrial sector the marketing efforts of other firms are the source of much of the influence in this area. The nontask variables provide the general environment in a macro sense, in which firms and individuals function. The general social, cultural, and political environment provides the basis for determining the values of the society, in which all individuals are a part. Hence, many values possessed by individuals are a direct function of society's values, and are present and active in both the industrial and the ultimate consumer contexts.

Organizational and Family Factors

Formal organizations and the family are homogeneous

in one very important aspect--their "purpose". Continuity is a common goal. "Objectives, policies, procedures, structure and systems of rewards, authority, status and communication define the organization as an entity and significantly influence the buying process at all stages."⁶ The variables which define the formal organization are well applied in the definition of the family unit. The task factors of specifying the purchase of goods and services for the attainment of the organization goals are very important in both contexts. Herein is a divergence which has led many communicators to follow the traditional one-way effect in the communication process. For goods purchased by industrial buyers, technical information is required more often, relative to the type of information required by ultimate consumers. Thus, without considering the other factors which influence consumers and by employing a one-way model, it can be concluded that traditional advertising theory has determined that industrial buyers require more "rational" information and ultimate consumers require more "emotional" information in the advertising directed at them. However a consideration of the nontask organizational variables would do much to show the error in this thinking. The status and power systems within an organization as well as the development of favourable relations with suppliers provides another dimension to the types of information required in the industrial sector.

The totally "rational" approach needs to be supplemented with other types of information to be consistent with the nontask variables. Similarly it is the nature of these nontask variables in the ultimate consumer sector which has led advertising strategy to erroneous thinking. The status and power which are present do not overshadow the need for "rational" information which is required for high cost goods which are specified by the ultimate consumer. With respect to the organizational factors, it would appear that industrial buyers and ultimate consumers are indeed influenced by task and nontask variables, more than traditional thinking has indicated.

Interpersonal Influences

A major difference between the industrial buying process and the ultimate consumer buying process is the number of individuals involved in the purchase of the product. In the industrial sector the buying process usually involves several people whereas in the ultimate consumer context, the purchase decision is usually made by one person. Deciders, influencers, buyers, users, gatekeepers all form what is known as a buying center.⁷ All persons who influence the purchase decision are members of the buying center. The buying task is the primary function of these members. It is also recognized that, as with any group of people, social activity plays an equally important

role. Each member brings with him all of the factors which influence him personally into the organization. This includes his individual traits (as will be outlined in the next section) which may not be totally "rational" for the purchase decision. Thus when considering advertising for both groups, marketers must recognize that the industrial purchase decision is usually made by a group of individuals more often than the frequent individual purchase in the ultimate consumer market. However, the family unit may be composed of a buying center similar to the industrial firm. The decision process is frequently less complex in the family unit but is still an important consideration. The interaction of the task variables (the buying decision) and the nontask variables (the social interpersonal variables) results in an orientation which includes both rational and irrational characteristics. Promotional efforts must recognize this interaction and be directed at the different roles within the decision group.

Individual Factors

The strongest argument that industrial buyers do not require rational information alone stems from the following point.

Each person involved in the buying process brings to it a set of needs, goals, habits, past experiences, information, attitudes, and so on, which he applies in each specific situation the individual accepts the

objectives of the organization as his own while also deciding that the organization represents the best opportunity to pursue his own objectives and satisfy his own needs.⁸

Thus, the industrial purchaser cannot be divorced from his role as an ultimate consumer in the organizational setting. Likewise, he is also influenced, as an ultimate consumer, by his purchase behaviour in the organization. All of the socio-economic variables with which a person is characterized and so intimately uses in personal consumption, are also pervasive influences when that same person functions in the industrial setting. These internal variables consisting of predispositions, awareness, attitudes, preferences for suppliers and products, self-confidence and risk taking ability are important forces in the purchase decision. An understanding of the external and internal variables and the effects of their interaction will improve our understanding. The traditional approach makes a misjudgement in this area. The internal forces are important but they are not the only important forces. The thinking that "emotional" information is the ideal type of ultimate consumer information would seem to indicate that traditionalists view the consumer as one who requires information that is consistent only with the perceived social and cultural environment.

The foregoing consideration of the factors which influence consumers, is best summarized by Webster and Wind

(1972):

Assuming that the organization buyer is a rational, economic man motivated by profit rather than by personal gratification has led many advertisers and scholars to believe that 'rational appeals must be stressed instead of the emotional ones often so effective in consumer advertising'. Yet the fact that nontask variables play an important role in determining organizational buying behavior suggests the need to avoid generalizations of this sort and to design the advertising message in each case on the basis of the characteristics of the members of the buying center (personality, attitudes, etc.), the policies and nature of the organization (size, objectives, etc.), the objective of the advertising campaign and its relation to the sales force plan, and the particular characteristics of the product/service to be advertised.⁹

A summary of the above factors with respect to Nicosia's definition of buyer behavior and the phenomenistic approach to the communication process yields the following. The external stimuli which includes the environmental, organization, and interpersonal factors interact with the internal stimuli and/or individual factors in an environment which is both rationally and irrationally oriented.

Summary

We must consider both industrial buyers and ultimate consumers using a sound basis of understanding this interaction of the four factors. Traditionally, it has been considered by communicators to be a simple task as industrial buyers have been considered rationally oriented and consumers have been considered irrationally or emotionally

oriented. Serious doubts have been raised at this traditional generalization.

In his buying habits, the industrial buyer is more human than industrial marketers have realized. The industrial buyer not only has the same biological needs that you and I have, but he also has the same psychological drives, urges, desires and ambitions. His environment conditions tend to express his needs and desires in a certain, perhaps restricted way because of his vocation . . . But in the actual buying situation he is human, he is influenced by the same senses and reactions that influence all of us when we buy.¹⁰

Just as industrial buyers are more subjective than is generally thought, it can be seen that ultimate consumers are more objective than traditionally thought. From the background literature, it appears that the traditional view, that extremes of rationality and irrationality exist, is not consistent with a consideration of the factors which influence individuals, independent of their role.

It is clear that industrial purchasing decisions are not solely governed by a rational review of the problem posed, if rational is to be interpreted as a long fully considered view of all possible alternatives in order to maintain maximum company profitability. It is also apparent, however, that actions taken which do not accord with this everyday view of rationality cannot be described as totally irrational or emotional.¹¹

It would appear that industrial buyer and ultimate consumer groups are more homogeneous than has been previously thought. To communicate information to these two groups is a very complex task. To better understand one of the

most prominent forces within individuals, that is their attitudes, will help to broaden our thinking as marketers.

Development of Hypotheses

The Specific Problem

In light of the preceding discussion, it becomes a question of the extent to which roles are differentiated between groups. This will provide a guide as to similarities and/or differences between ultimate consumers and industrial buyers. The root of the question lies in the ascertainment of the interaction effects of the external variables and internal variables for industrial buyers and ultimate consumers. As will be shown in the next chapter, a measure of attitudes toward print advertising will reflect this interaction. This knowledge will be valuable to marketers for the design of effective messages.

The following hypotheses are set up:

Hypothesis 1: Print advertising messages should stress a rational appeal for industrial buyers and an emotional appeal for ultimate consumers for similar goods and services purchased by both groups.

Hypothesis 2: Print advertising messages should stress neither a rational appeal nor an emotional appeal but rather a combination of the two appeals, for similar goods purchased by both industrial buyers and ultimate consumers.

The experiment will test the hypotheses as set up.

Acceptance and/or rejection of the hypotheses will not only provide direction for advertising appeals to follow, but also yield valuable insights into the roles of ultimate consumers and industrial buyers. In summary, the roles adopted by the two groups will reflect the rational and/or irrational orientations as a function of the interaction between internal and external variables.

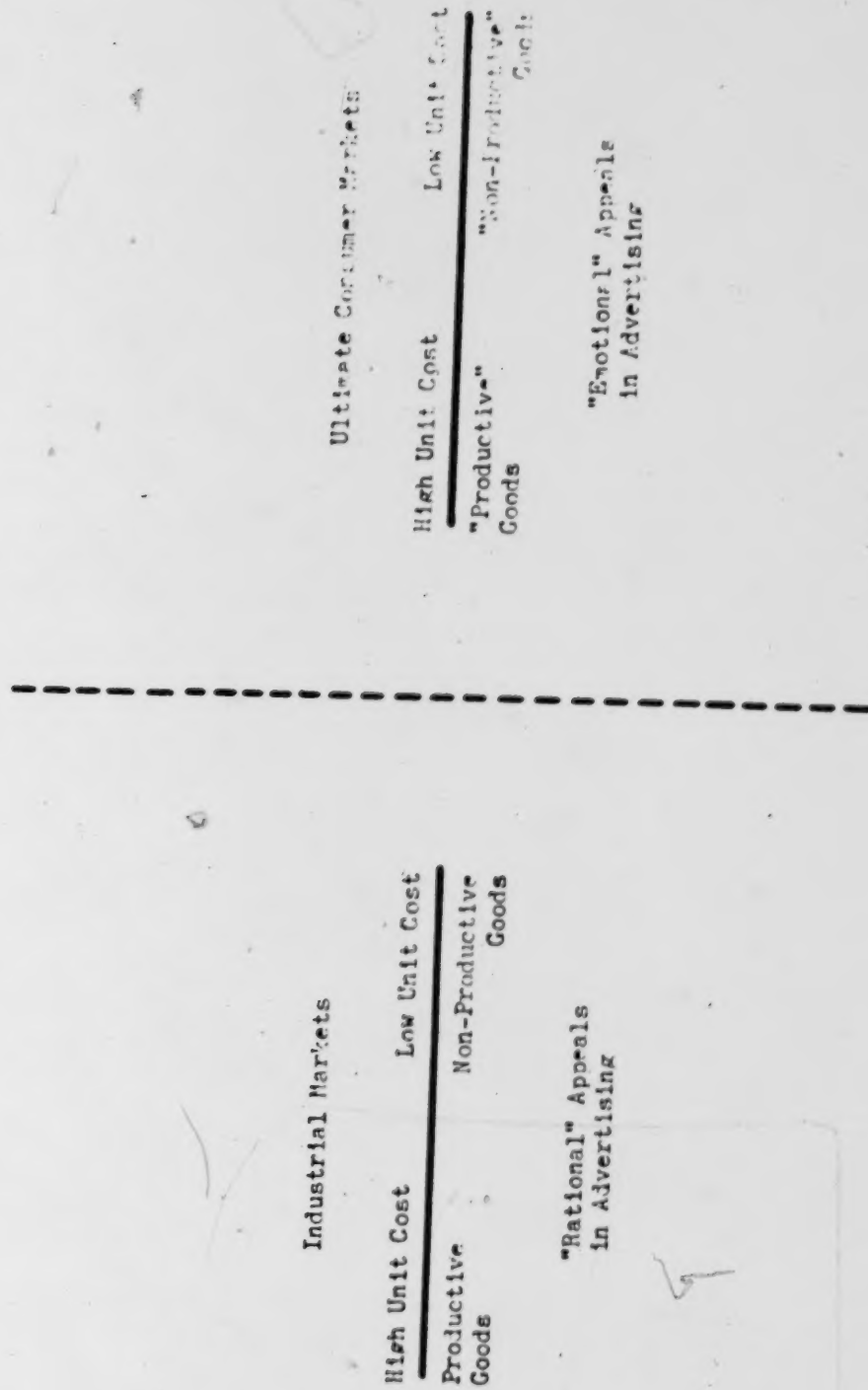


Figure 1: Hypothesis 1

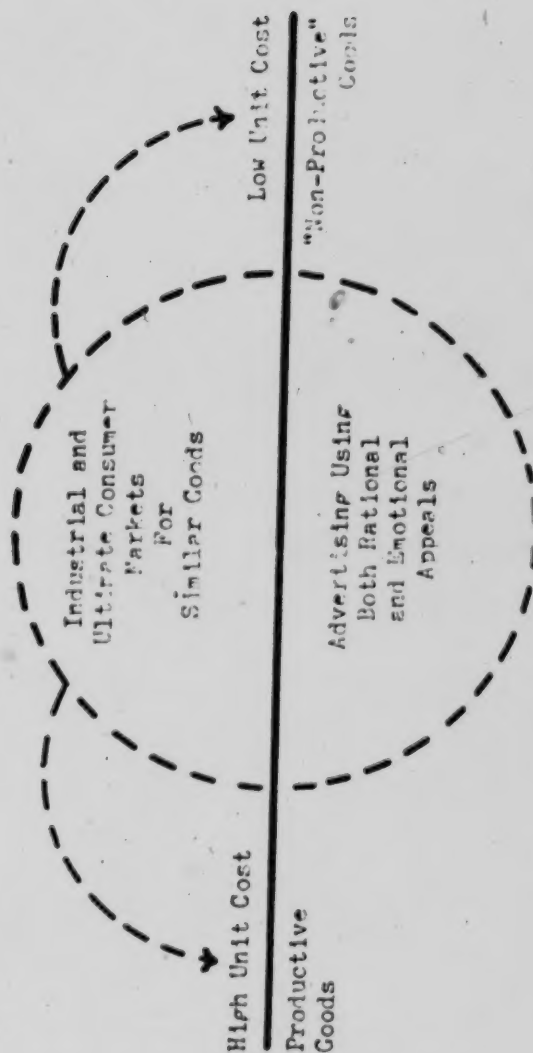


Figure 2: Hypothesis 2

CHAPTER 2

THE IMPORTANCE OF MEASURING ATTITUDES

Reasons For Studying Attitudes

Advertising research is probably one of the most difficult tasks that marketers must perform. The research that has been undertaken to date has proven that advertisers are dwelling in a "land of no returns". The various tests which are used to measure advertising effectiveness do little to aid the communicator's task.

Young (1972), has shown that recall measures (e.g. magazine advertisement recall) are inappropriate for measuring advertising effectiveness because of their irrelevance in measuring implicit (subjective) and explicit (objective) copy. It was found that recall is only a partial measurement of explicit copy effectiveness and is not relevant at all for the measurement of implicit copy effectiveness.¹

Playback methods are verbatim reports of what respondents can recall about an advertisement a short time after exposure. It is different from the simple recall test in that advertisements are presented in a folder with the interview held immediately after. This method has the same faults that straightforward recall tests have.

Observation tests must be approached with caution. The reactions of the individual must be qualified as to

their underlying reasons for occurrence. Thus, as an inferential measuring device, it fails to provide insights into the reasons for behaviour.

Many firms resort to the use of sales as a measure of advertising effectiveness. "If sales were the only means by which advertising effectiveness could be evaluated, the large rank of advertisers would be relegated to no measurement at all".² "It is not enough to know that advertising works through sales tests. If we are to truly harness the power of advertising, we must know how it works".³ As sales tests and the like evoke little information about advertising effectiveness from the communicator's view, and an even smaller amount of information about the audience, there appears a need to use other means of deriving information useful to the communicator.

This study will depart from the traditional methods of measuring advertising effectiveness from the communicator's point of view. Marketers require more than the simplistic tests for obtaining responses to variations in advertisements if they are to succeed in their task. What is needed most is a measure of advertising effectiveness from the point of view of the audience. An investigation of attitudes of message receivers will provide a fuller understanding of communication effectiveness.

The previous chapter outlined four factors, within a two-way communication process, which help define consumer

behavior. It would thus seem reasonable that "...in approaching an industrial customer (and ultimate consumer), the marketing communicator must make it the first order of business to identify the specific goals and needs that will motivate the customer's interest in the product and define his attitude toward it".⁴ What is needed therefore in the industrial sector, is to go beyond considering the "traditional variables of price, quality, delivery, quantity and service", that is, those "variables that have commonly been considered in the purchasing literature to be the sole determinants of the buyer's decision".⁵ In the ultimate consumer sector, the purchaser must be considered in terms of his rationality, that is, his concern for the variables of price, quality, delivery, quantity and service, instead of the traditional view of being frequently open to influence by emotional appeals.

The interaction of external and internal variables on the consumer (both ultimate and industrial) provides a key for a source of deriving information about the audience. The individual's internal variables, that is, the individual factors such as predispositions, awareness, attitudes and preferences are a function of the interaction with the external variables--the environment, organization and family, and interpersonal influences within a rational and/or irrational orientation. When a person enters an organization, he is implicitly accepting the goals of that

organization as his own. Therefore, to examine the internal variables would also provide insights into the effects that the external variables have in the interaction. The degree of rationality will also be perceived because the interaction of variables is oriented to an environment which demands rational and/or irrational (emotional) information.

Attitudes are one of the most "controversial" of the internal variables which are studied in the field of consumer behavior. Traditionally they are viewed as working in the consumer's "black box" of internal variables which process messages as they are communicated from the source. The "black box" of intervening variables, in the traditional sense of the one-way communication model, has been something into which little research has been undertaken by many advertisers. The traditional advertising message has not been designed to be consistent with these interactions of internal and external variables. This is because they are either not known to provide significant influence, or if they are known to, they are not measured, which would provide guidelines for the message design at the source.

The study of attitudes will do much to broaden the marketer's view of his target audience.

Definition of Attitudes

The early research in attitudes followed Thurstone's definition: "the degree of positive or negative affect associated with some psychological object".⁶

Attitudes then came to be defined by many writers as consisting of an affective component (evaluative responses), a cognitive component (perceptual responses) and a conative or behavioral component (overt actions).⁷ This multi-dimensional view of attitudes arose as a result of an attempt to account for the host of possible reasons for an individual's subsequent behavior.

More recently, many researchers have considered attitudes as a unidimensional concept and have referred back to Thurstone's definition. Osgood gives a summary of the characteristics of attitudes.

- (a) they are learned and implicit
- (b) ...they may be evoked either by perceptual signs or linguistic signs
- (c) ...they are predispositions to respond evaluatively to these signs and
- (d) ...the evaluative predisposition may fall anywhere along a scale from "extremely favourable" through "neutral" to "extremely unfavourable".⁸

Fishbein subscribes to this notion and divides the multi-dimensional definition into attitudes and beliefs.

"Attitudes are learned predispositions to respond to an object or class of objects in a favourable or unfavourable way. Beliefs, on the other hand, are hypotheses concerning the nature of these objects and the types of actions that

should be taken with respect to them".⁹ Fishbein sees attitudes as "a conceptual system in which only the affective component is treated as attitudinal, and the other two components (cognitive and conative) are linked to beliefs".¹⁰ Fishbein and Raven¹¹ define beliefs as the probability dimension of a concept, that is, whether its existence is probable or improbable. Attitude therefore measures whether the concept is good or bad. Criticism may be raised for restricting the definition of attitudes to the evaluative dimension, risking a possible loss of meaning in understanding the consumer. Fishbein, however, makes two important clarifications for the reasons underlying the more simplistic view of attitudes.

1) Taking a unidimensional view of attitude does not imply that one should ignore cognition and conation. Rather it implies that beliefs and behavioural intentions must be studied in their own right, as independent phenomena that may be related to attitude and behavior ...Furthermore there is considerable evidence showing that this single 'affective' score is highly related to an individual's beliefs about the object...Fishbein (1963) and others has demonstrated that an individual's attitude (or affect) toward any object is a function of his beliefs about the object (i.e. the probability or improbability that the object is related to some other object, value, concept, or goal) and the evaluative aspects of those beliefs (i.e. the evaluation of--or attitude toward--the 'related' concept).¹²

2) ...attitude is a more useful scientific word when it is given restricted meaning... the operations by which attitudes are measured almost invariably yield a single score (evaluative) which is unlikely to

reflect these three different components in any precise fashion...Multidimensional concepts are notoriously difficult to employ in rigorous theory, and they create almost unmanageable problems when theory is translated into research.¹³

By defining attitudes as unidimensional, a very concise and accurate description of an individual evaluation of a psychological object may be found. Singling out the evaluative concept of internal factors will provide clues to the nature of the external factors with which the internal variables interact. The rational and irrational orientations will be reflected in the evaluative dimension, as it is a function of the interaction.

Determining attitudes of the two groups will help provide the knowledge of the factors affecting the audience. This will be very helpful to communicators in designing effective messages. Identifying attitude as the source of valuable knowledge about industrial buyers and ultimate consumers is only the first step. Effective and accurate measurement of these attitudes is equally important.

Attitude Measuring Instruments

Over the years, psychologists have attempted to develop "quick and convenient measures of attitude that could be used with large groups" which "...also provide us with one means of obtaining an assessment of the degree of affect that individuals may associate with some psychological object".¹⁴ As a result, many forms of attitude scales have

been developed. What the researcher needed most was a single score which would locate the person on continuum as to how favourable or unfavourable he was to the psychological object.

Likert and Thurstone Scaling Tests

Both Likert and Thurstone developed attitude scaling tests which were based upon carefully selected belief statements. (Other scales such as Guttman and Bogardus are similar in their design). Without giving a complete description of the techniques it is sufficient in this context to show that their basic design is inappropriate for the purpose of this study.

Both tests determine attitudes by the direction and intensity of a person's beliefs and disbeliefs about an attitude object. Intensity of beliefs does not serve as a determinant of attitudes but the direction of the evaluation does. Both tests also view the process of attitude organization as either cognitive summation (Likert) or cognitive balance (Thurstone).¹⁵ The theoretical conceptions of attitude, which are accepted by these tests, are not consistent with the nature of attitudes accepted in this study.

Semantic Differential

C. E. Osgood developed the semantic differential as a device to measure meaning by locating an object or concept on a pro-con continuum. The semantic space consists of evaluative, cognitive and conative dimensions. The evaluative dimension was found to be the best measure of attitudes.

It seems reasonable to identify attitude as it is ordinarily conceived in both lay and scientific language, with the evaluative dimension of the total semantic space...The meaning of a concept is its location in a space defined by some number of factors or dimensions, and attitude toward a concept is its projection onto one of these dimensions defined as "evaluative".¹⁶

Thus, the semantic differential is a good measurement of attitude defined as a unidimensional concept.

The semantic differential is comprised of a series of bi-polar scales which present different pairs of word opposites. By selecting appropriate word pairs, the evaluative dimension (i.e. attitudes as a function of an expressed belief evaluation) can be accurately measured with respect to a stimulus. Mindak (1961), provides a guideline for summarizing the features of the semantic differential.

1. It is a quick and efficient means of obtaining readily quantifiable information for all sample sizes. Not only the direction, but the intensity of opinions and attitudes toward a concept are indicated.

2. A comprehensive "picture" of the image or meaning of an object can be interpreted.
3. It is a standardized technique for getting at the multitude of factors which an object possesses.
4. It is easily repeatable and quite reliable.
5. Stereotyped responses are avoided and it allows for individual frames of reference. Also quick responses are given when the subject is properly instructed to do so. Thus, first impressions are obtained.
6. Some question phrasing problems are eliminated, which facilitate the interview when a person cannot express their true feelings to an interviewer by verbal response.
7. The direction of the attitudes is useful for further and more intensive research using many of the other subjective and qualitative projective techniques.¹⁷

However, as with every measuring technique, many people fault it for the following reasons. (These faults are also refuted.)

1. One problem which is not totally peculiar to the instrument, is the method by which information must be procured. Hofsoos (1970), and others, cite the problem of the consumer assuming the role of an expert or disinterested party. The response of

the "typical" consumer is that which is desired. However, if the situation is approached with caution and the experimenter is sensitive to this occurrence, valid and reliable findings can be found.

2. When persons are positively oriented toward a stimuli, they tend to rank all of their responses favourably and express the extreme view for those stimuli which are unfavourable. However, by randomizing the polarity of the scales, the subject is less inclined to transfer information from one stimulus to the next.
3. Wells and Likert (1971), raise some serious doubts about the structuring of scaling techniques. A small number of topics (or scales) that are covered in the study, limits the study's coverage to the concepts thought important to the researcher. However, a selection of scales from a large number of word pairs will result in a good coverage, despite the reduction relative to other methods.
4. The short name on the scale tends to limit the true meaning of the idea which is to be considered. However, carefully selected word opposites will do much to reduce the narrowness of meaning of the word pairs.
5. The scale is limited to those dimensions that the

researcher thought important. But the unexpected cannot be accounted for totally in any measuring device. One method for attempting to account for the unexpected is to supplement the attitude measuring procedure with some open-ended questions.

Depth Interview

This "qualitative" type of interviewing is used to "explore the underlying predispositions, needs, desires, feelings and emotions of the consumer".¹⁸ Vickers (1971) stated that it was not exact statistical measurement which was the goal of the depth interview, but rather some guidance which would add to previous knowledge and experience while providing a check on it.¹⁹ It is also a good idea collection instrument from which hypotheses can be developed and used in the performance of subsequent testing by more objective procedures.

With these limitations it evokes a risk for it to be used exclusively as an experimental method. A minimum sample of the population is all that is required to arrive at general attitudes. However, this sample is rarely representative of the population. Although it is an invaluable mechanism in establishing existing attitudes in a small group, the results cannot be generalized to different levels in the population. The key feature of the depth interview is to provide insights for further testing and uncover unexpected attitudes.

For the purpose of this experiment the depth interview is unfeasible. However, open-ended questions resemble the theory of the depth interview.

When used in conjunction with the semantic differential many of the underlying attitudes can be uncovered about the subject's real world situation if the questions do not pertain to the actual experiment. This eliminates the restrictions placed on the subject by the word-pairs of the semantic differential.

CHAPTER 3

EXPERIMENTAL DESIGN

Procedure

The experiment was a factorial design which enabled more than one experimental variable to be tested. This permitted the determination of the main effects of each variable and also the interaction effects of the variables.¹

Three test advertisements were presented to ultimate consumers and industrial buyers. Six attitude scales were presented by a semantic differential. These were answered for each advertisement. The advertisements were systematically rotated from test to test to reduce the effects of primary exposure. After the advertisements were viewed and the scales rated, each subject was asked two specific open-ended questions. Any general comments about print advertising were also entertained by the interviewer.

The general criteria of the measuring devices presented in the preceding chapter was incorporated in the experimental instruments. The specific details of the test advertisements, the measuring devices and the sample are given in the following sections.

Design of the Test Advertisements

The General Criteria

The experiment demanded that realistic stimuli be presented to industrial buyers and ultimate consumers so that reliable information could be obtained from those groups as to their attitudes toward various appeals found in print advertising. More than one stimulus was felt to be required to enable a good comparison of the different appeals which advertisements may possess. Too many stimuli could possibly engender poor and non-realistic responses through the creation of boredom and possible frustration at the inability to distinguish between traits of a large number of advertisements. It was for these reasons that three black and white print advertisements were designed. Each advertisement presented a different appeal for the product advertised. One advertisement stressed an "emotional" appeal, another a "rational" appeal and the other represented a compromise of the two preceding advertisements. The details of the advertisements will follow in the next sections.

The subject of the test advertisements had to apply to both markets, that is, the advertisements could well appear in industrial journals as well as ultimate consumer oriented magazines. The various newspapers oriented to each group could also be possible media for presenting the messages.

The rental, leasing or purchasing of oil paintings was chosen as the subject of the advertisements for several reasons.

1. In the industrial sector, paintings represent a non-productive good. Their purchase entails a somewhat less detailed decision-making process than productive goods, such as machinery directly involved in the manufacturing process. With reference to Figure 1, paintings would be located on the extreme right of the industrial buyer's continuum of goods which could be purchased.
2. Paintings are a good which require a more detailed decision-process in the ultimate consumer sector than the industrial buying sector. They are a high expense item and usually require much deliberation on the part of the consumer before a sizeable portion of money is spent. It was recognized that the renting or leasing of paintings would reduce the initial investment substantially. However, consumers would be expected to examine the service closely before entering into a rental or lease agreement. Thus, referring to the ultimate consumer's continuum in Figure 1, paintings would be located at the extreme left of the scale. It was also

recognized that a particular painting may be purchased on impulse when it is viewed by a consumer. However, it is most likely that a person would be favourably predisposed to purchasing paintings before a final selection would be made.

3. Paintings do not have any "brand" name or company image biases attached to them. Thus, any bias which a person may possess toward other classes of goods, will be minimized when selecting paintings or viewing advertisements for them. It was most important that the sample members be as neutral as possible with respect to their considering the advertisements. A source of possible bias toward paintings could be with respect to particular artists. The test advertisements mention only that the artists are Canadian and do not specifically state individual artist's names.
4. The name, address and phone number of the company were fictitious to ensure that people were neutral in their opinion of the advertiser. The service is relatively new for a private company to specialize in. This ensured little probability of persons relating adverse experiences with like companies into the experiment.

Similarities of the Advertisements

The general format of the three advertisements was kept very similar for one key reason. It was not the various mechanical variations of advertisements which was being tested in this experiment. It was the variations in the appeals which was of prime importance. To vary the layout of the advertisements to a significant degree would result in the test subjects focusing their attention solely on the differences in attractiveness or the ability of one advertisement to catch-the-eye over another. It was felt that a favourable response of one advertisement over another on this variable alone, would bias the other variables which were being considered. Thus, a standard of good visual attractiveness was set, which was met by all three advertisements.

Each advertisement used the following format. An 8 1/2" x 11" sheet of semi-gloss white photographic paper was mounted on black mounting board, with a 3/4" border. (This was to facilitate the presentation of the advertisements for ease of handling and for keeping the advertisements in good condition from test to test.) A picture frame occupied approximately the upper half of the page and contained a headline in bold letters. The headlines were thus located approximately two-thirds from the bottom of the page. Approximately the lower half of the page displayed copy which continued the theme of the headline above it.

Black and white was used exclusively for two reasons. As the visual appeal was to be kept relatively constant between advertisements, colour would only serve to raise the level of eye appeal equally for the three advertisements. It was felt that attractive black and white stimuli could be created, especially with the format that was being implemented. Actual pictures were not used to ensure that the advertisements would not be considered in terms of their visual and aesthetic appeal alone. Thus, the picture frames and quantity and density of the print resulted in approximately the same amount of white space and the same general tone of greys for each advertisement. The general format and subject of the advertisements was designed to allow respondents to give a fair comparison of appeals between advertisements. The probability of a particular advertisement being superlative on visual and or subject appeal alone was small.

Characteristics Which Differentiated the Advertisements

Although the advertisements were visually similar, there were basic variations in their messages and presentations. The advertisements were designed to "help" project visually what the appeal of the message was. Also the style of lettering, the type of frame and the overall appearance of the advertisements were slightly differentiated from one another, to help keep interest in the

experiment high. The following are the details which were incorporated into the advertisements.

The "Emotional" Advertisement (see Figure 3)

This advertisement was designed to be exemplary of much advertising which often appears as ultimate consumer advertising. The headline "say something nice about yourself" explicitly says nothing about the product which is being advertised. This "teaser" type of headline plays on the person's personal aspirations with his possible reference to either formal or informal groups. It was set in lower case garamond regular italic type and appears to be quite formal within the detailed frame. As the information content about the product itself in the advertisement was minimal, the headline and frame were the dominant characteristics. Only forty-three words of copy, (not including the company name, etc.), or one-third as much as the rational advertisement's copy, was presented. It was set in univers medium italic to complement the style of the headline and frame. The copy does little more than to tell the reader that the subject of the advertisement is the renting or leasing of paintings. The main appeal follows the lead of the headline. The purpose of the information given is to show the reader another dimension of what the possession of paintings will accomplish for them personally. All details of the service could only be derived by further inquiry. The advertisement was designed

to present very little information about the actual product, yet give the reader a good idea of one aspect of the service's benefits.

The "Rational" Advertisement (see Figure 5)

This advertisement was designed to be in contrast to the "emotional" advertisement. It was to be representative of much industrial advertising where a good amount of information is presented in a simple manner. The headline "Now you can rent or lease paintings to meet your decorative requirements" could easily be presented alone so as to indicate what the service entails. It was set in upper and lower case univers medium roman type inside a simple black painted frame with plain burlap matte. The rational and straightforward approach is given in the headline to indicate the forthcoming message of the copy.

The copy comprises 120 words set in univers light roman. It was arranged in a block design to resemble standard text and give the complete advertisement a simply designed appearance. The lead of the headline is continued here. A firm price, all terms, arrangements and sufficient details of the service are outlined. A person reading the advertisement receives ample information about the actual service without the emotional type of information given in the "emotional" advertisement. Any "frills" were removed from this advertisement to enable the message to be clearly and concisely presented.

The "Neutral" Advertisement (see Figure 4)

This advertisement was designed to be located half way between the appeals of the "rational" and "emotional" advertisements. The headline "When you see a bare wall -- see us" does not indicate what the service entails, neither does it totally play on the sentiments of the reader. Following the condition that it be the "middle-of-the-road" advertisement in this context, the headline was set in upper and lower case garamond regular roman inside a wood-grained frame with a quality matte. The enclosed headline acts as a lead to prompt the person to read further to see what the advertisement is about.

The copy contains 77 words which is approximately twice the length of the "emotional" ad's copy or two-thirds the length of the "rational" advertisement's copy. Again it represents the middle advertisement by being set in univers medium roman. Some idea of the financial commitment is given without quoting a definite figure. Neither the emotional nor the rational appeal is stressed. Some information about the actual service is given as well as information about what the service will personally do for the consumer.

By incorporating "emotional" and "rational" appeals in this advertisement, it became a viable alternative to the extremes presented by the other advertisements.

Figure 3

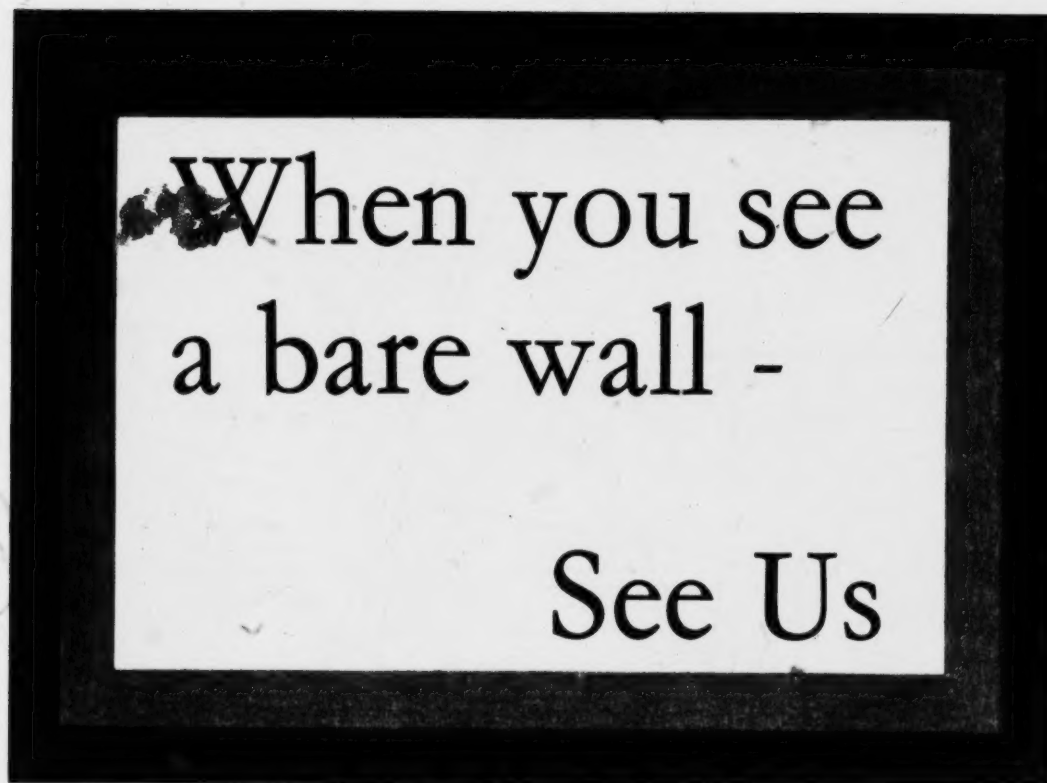


*Renting or leasing one, or a series
of fine paintings from Painter's Pavillion,
can help you present the exact image you desire.*

*What you hang on the wall won't be all you will get-
your friends will be the first to tell you.*

**PAINTER'S PAVILLION LIMITED
11740 - 88A STREET
EDMONTON ALBERTA 436-4481**

Figure 4



A few dollars each month will enhance that wall with an original oil painting from Painter's Pavillion. Our galleries contain the widest selection of quality paintings by renowned Canadian artists.

Let us help you select one or many images which will reflect your good taste. Financial arrangements can include renting, leasing or buying with suitable terms.

See us, and we will have one of our salesmen assist you in doing something for that wall - and for yourself.

PAINTER'S PAVILLION LIMITED
11740 - 88A STREET
EDMONTON ALBERTA 436-4481

Figure 5



Now you can
rent or lease
paintings
to meet your
decorative
requirements

For as little as \$2.50 per month, you can rent an original oil painting by a Canadian artist. Where several paintings are chosen for your particular environment, Painter's Pavillion will replace them whenever you feel need for a change.

Or, a modest monthly payment will enable you to lease any number of paintings, with the option to buy at the end of your lease period.

Of course you may still purchase outright any painting, with convenient terms if you wish. Not only will you obtain aesthetic pleasure, but also a secure long-term investment.

Our design consultants will help you choose from our wide selection, the right paintings for you. For the best in sales and service, contact us soon.

PAINTER'S PAVILLION LIMITED
11740 - 88A STREET
EDMONTON ALBERTA 436-4481

Questionnaire Design

The semantic differential was found to be the most ideal attitude measuring instrument for this study. It has been found that dividing each scale into seven alternatives is optimum.² The following seven positions are used for ranking between the word-pairs.

- | | |
|-----------------------|----|
| 1. extremely negative | 7. |
| 2. quite negative | 6. |
| 3. slightly negative | 5. |
| 4. neutral | 4. |
| 5. slightly positive | 3. |
| 6. quite positive | 2. |
| 7. extremely positive | 1. |

The polarity of the word-pairs was randomized so that every word-pair did not consistently favour one end of the scale over the other. This was designed to discourage subjects from ranking word-pairs with reference to advertisements previously viewed in the experiment. Instructions for correctly completing the semantic differential were given before the test began (see Appendix). All respondents were also verbally asked whether they fully understood these instructions to ensure they would correctly answer the scales. The answer sheets for the semantic differential appear in the Appendix.

The adjectives were determined using a guide which Ferber³ gives for the design of advertisements to make them

equally interesting.

1. attractiveness
2. information value
3. readability
4. type of appeal
5. engendering product interest

Using the above guideline the following scales were used: attractive-unattractive, informative-uninformative, clear-vague, interesting-boring. The scales of simple-complicated and exciting-dull were also used to help compare the interest in each advertisement. It was the type of appeal that was intentionally differentiated between advertisements. It was not the intention of the study to determine if a person could simply distinguish between rational and emotional. The purpose was, however, that the attitude scores on the scales would reflect whether the subjects were in fact rationally and/or irrationally (emotionally) oriented. The scales were evaluative in nature, which was consistent with the unidimensional definition of attitudes as expressed by Fishbein and Osgood. "We must have measures of similarity between brands (and between advertisements) on more specific and theoretically dictated attributes of the brands (and advertisements)."⁴ As only the evaluative dimension is being measured, there is no need for fifty or sixty scales which is common in many semantic differential tests. Therefore the scales

have been selected to, 1) reflect the unidimensional view of attitudes, 2) measure the degree of similarity between advertisements, and, 3) reflect the rational and/or irrational orientation of ultimate consumers and industrial buyers.

Open-Ended Questions

As shown in the previous chapter, open-ended questions are valuable devices for uncovering "hidden" or "unexpected" attitudes. For this reason, two questions were posed to the subjects after they had viewed the advertisements and answered the scales.

Question (1): Do you feel that the print advertising which you see (a) during your day at work (for industrial buyers) (b) in your home (for ultimate consumers) is satisfactory, and why or why not?

Question (2): What would you like to see in an ideal advertisement?

These particular questions were asked in an attempt to have the respondent relate his real world environment (as opposed to the experimental environment) to the interviewer. It was hoped that this would provide further insights into the attitudes of the two groups toward advertising in general, and advertising appeals specifically.

The Sample

Ultimate Consumers

For this particular experiment, in which paintings are the subject of the test advertisements, it could be argued that anyone desiring wall hangings would comprise the population. Deriving a representative sample from this population presents a problem in determining who would be most interested in the service as presented in the advertisements. Very high income groups would likely purchase outright the paintings for their environment. Very low income groups would probably not show an interest in paintings, either for financial reasons, or that they may be oriented to other types of wall hangings. For this reason the lower income bound of the area chosen was \$8,000, and the upper bound, \$16,000. It was believed that a middle income group would express an interest in the rental or leasing of paintings. The other requirement for the sample area, was that the percentage of professional and managerial workers be over 20%. It was felt that the probability of obtaining higher interest in the experiment would be obtained by choosing areas of relatively higher numbers of these types of workers. It was, however, recognized that the probability was low of consistently obtaining these constraints in the sample from area to area. This was not felt to be a serious problem. It was believed that a good cross-section of the population would be obtained in each area, while defining these areas

would raise the probability of high interest in the experiment. The areas in which the interviews were undertaken and the income and occupation parameters are shown in the Appendix.

Of the twenty-one census tracts which were included in the sample, two people were interviewed in each of nineteen areas while in tract thirty-one and thirty-two only one person in each was interviewed. This was felt to give a good sample from which significant results could be obtained.

Industrial Buyers

Most businesses and industries comprise the population in the industrial sector. Organizations were chosen which would give a good cross-section of types of products and services. This included firms which are engaged in retailing, wholesaling, manufacturing, and servicing. Thus, firms purchasing goods for consumption and resale were included in the sample. Within the organizations, various members of the buying center were interviewed. (All of these members are referred to in this context as industrial buyers.) Including all members which influence the purchase decision, would result in obtaining a good cross-section of "buyers" within the organization. This would facilitate the understanding of the multiple interactions between the internal and external variables present in industrial purchasing. Accounting for the concept of a buying center, was regarded as a good measure of a representative sample

of the population, within the firms.

The sample was a very small portion of the total population of firms in the industrial sector. However the diversity of the sample members was felt to be a fair representation of the total population of firms in Edmonton.

CHAPTER 4

DATA ANALYSIS

Of the eighty subjects who were interviewed, forty were from the ultimate consumer sector, of whom twenty-one were female and nineteen male. The forty industrial buyers were comprised of thirty-three males and seven females. It was unfortunate that more females could not have been interviewed in this sector. (Resource constraints did not permit further search in this area.) Therefore, in the interpretation of the results, it must be remembered that females weight only 18½ of the variance in the industrial group. The ultimate consumer group was approximately evenly divided.

Of the eighty-one people contacted, only one person felt that they were unable to give a fair judgement of the advertisements. This was an excellent response rate for a door-to-door type of interview. A few questions were raised about how to accurately mark the scores on the scales. The instruction sheet which was provided before the viewing of the advertisements was well understood by most, however. There were no spoiled questionnaires.

The experiment produced two sets of data: 1) the attitude scores of the eighty respondents on the six scales measured for the three advertisements, and, 2) answers to the open-ended questions which were asked following the respondent's viewing of the advertisements.

The scores obtained by the semantic differential were interpreted by, a) testing the significance of the mean scores within the groups, b) testing the sex, group and interaction effects between groups, and, c) subjecting the scores to discriminant analyses to determine basic differences in the context between sexes and groups.

The hypotheses, as stated in the first chapter, are primarily concerned with the understanding of attitudes of ultimate consumers and industrial buyers toward print advertising. The data analysis has further subdivided the attitude scores into sex groups. This was felt to be necessary to help account for any possible variation in attitudes that may be found between groups.

Visual Analyses of the Attitude Scores

Data obtained by the semantic differential is more meaningful when it is visually presented. To aid this process a series of graphs are presented to show visually the difference in attitudes between the groups and sexes. These graphs are referred to many times when interpreting the attitude scores as rearranged by the computer. An explanation of the graphs and their significance follows.

Figure 6 presents the mean attitude scores of industrial buyers (solid line) and ultimate consumers (dotted line) for the six scales across the three advertisements. Figure 7 further subdivides the sample into four groups.

Mean attitude score differences are shown for male industrial buyers (solid line), female industrial buyers (solid line), male ultimate consumers (dotted line) and female ultimate consumers (dotted line).

Figures 6 and 7 attempt to show differences in groups across the three advertisements and possible trends across the advertisements on all scales.

Figures 8 through 11 consider the difference between the groups' mean attitude scores for the three advertisements, displayed by individual scales. Figures 9 to 11 show the difference by sex as well as by group.

Figures 12 through 17 present the attitude scores as cubes of information. This is a comprehensive visual analysis of the data. The figures do not stress the actual mean scores themselves, but rather the relative differences between groups and sexes. Male and female distinctions are indicated by the vertical axes, and the group scores are connected by solid lines to these axes. These figures help provide further clarification of the variance between groups. The less a plane of information rotates through the cube as subjects view the advertisements, the less variance is indicated. The more twisted or rotated the plane, the greater the amount of variance is indicated. By comparing the relative stability of the planes in the cubes between groups, a visual analysis of variance is obtained for the mean attitude scores between either the two or four groups simultaneously.

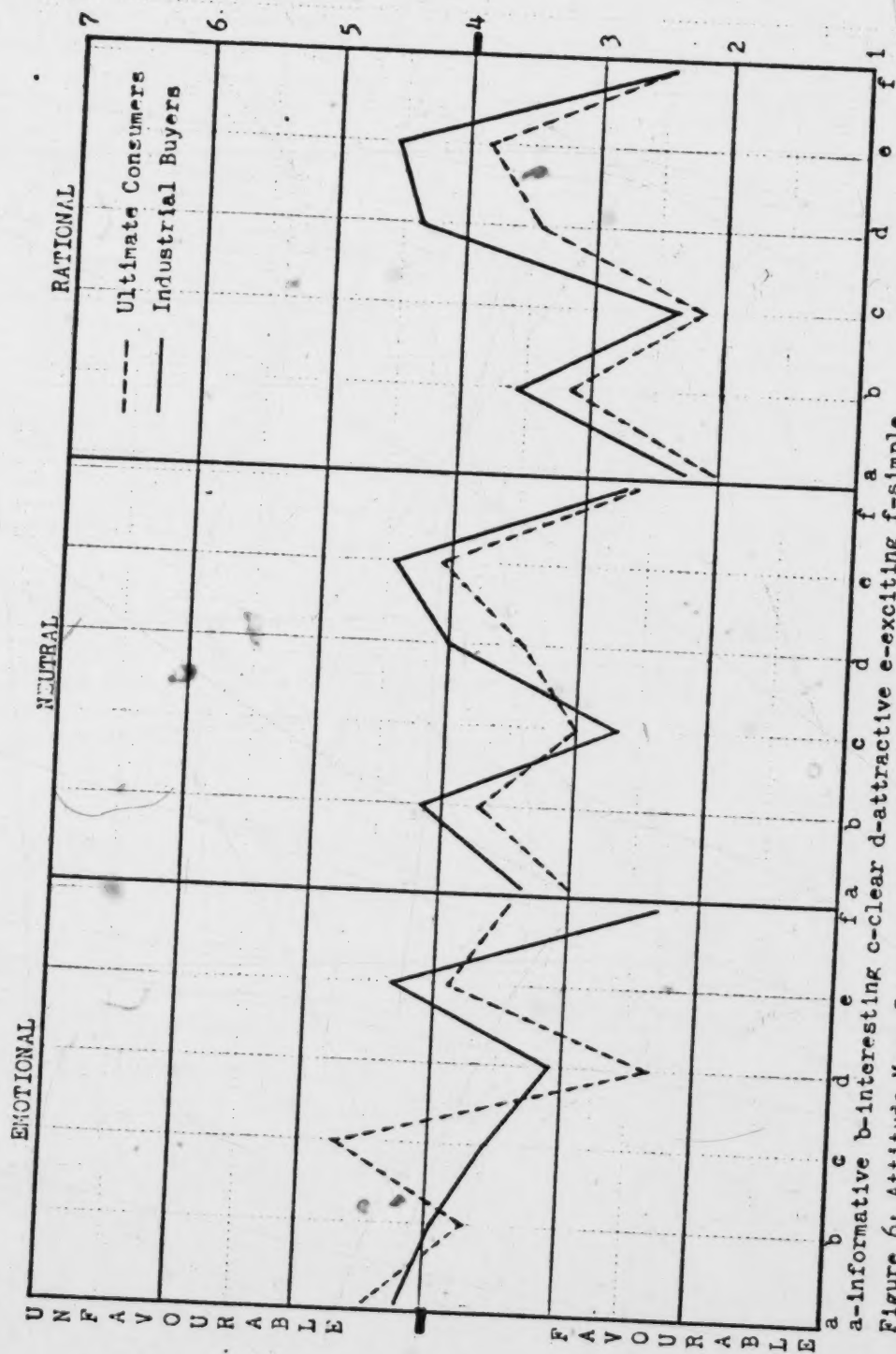


Figure 6: Attitude Mean Scores of the Two Groups Across the Three Advertisements

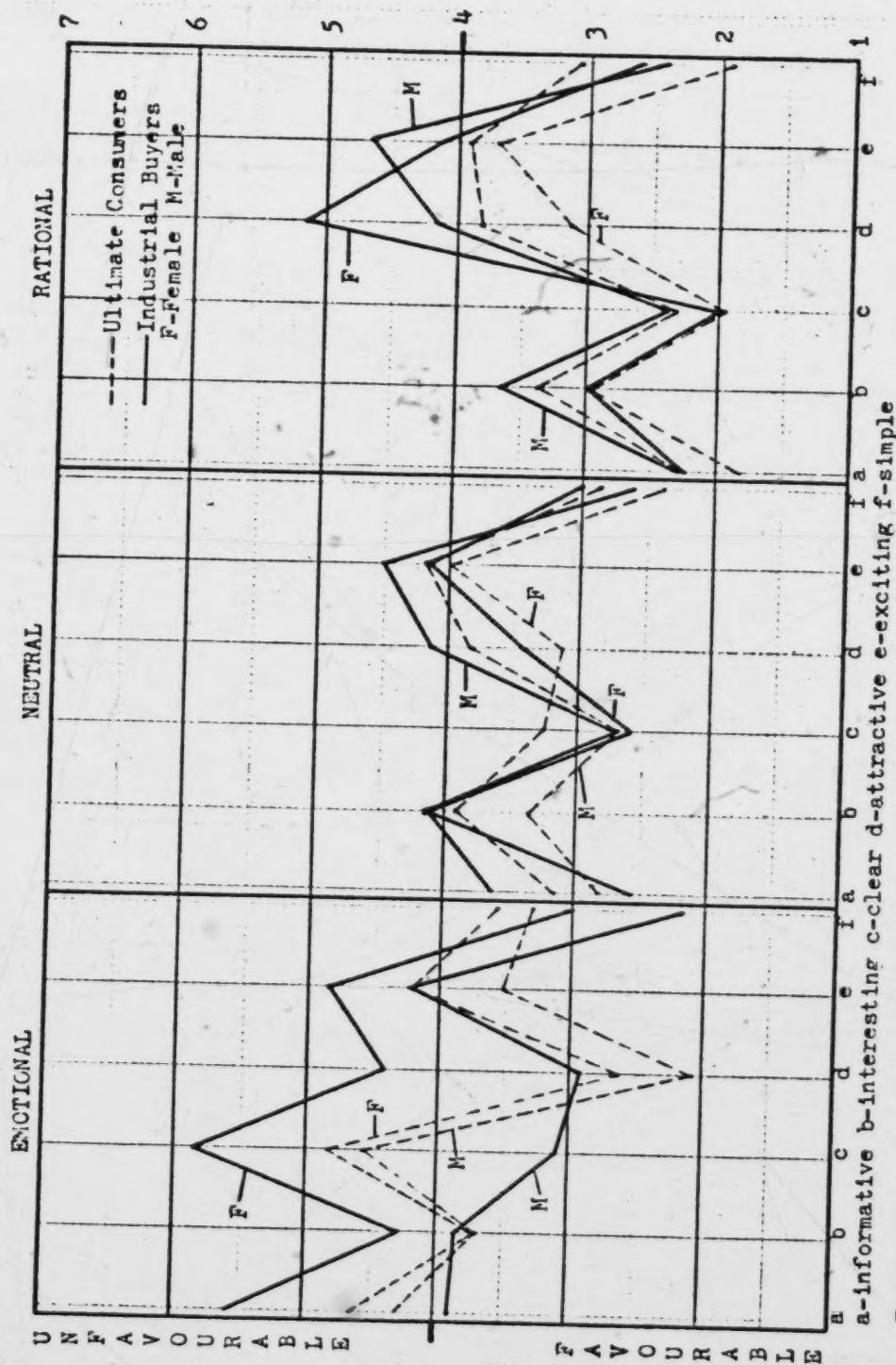


Figure 7: Attitude Mean Scores of the Four Groups Across the Three Advertisements

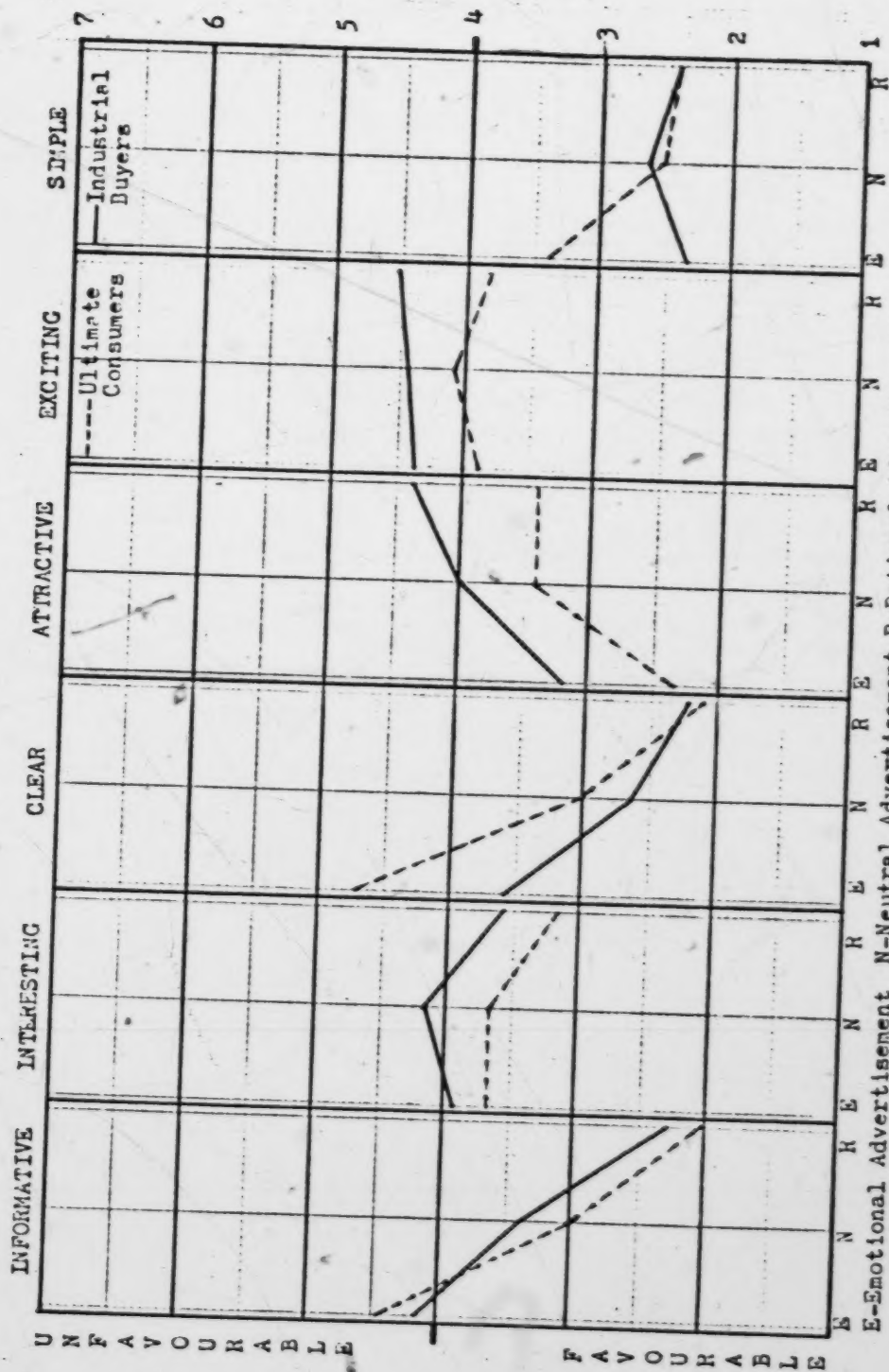


Figure 8: Attitude Mean Scores of the Two Groups Across the Six Scales

Figure 9: Attitude Mean Scores of the Four Groups Across the Informative and Interesting Scales

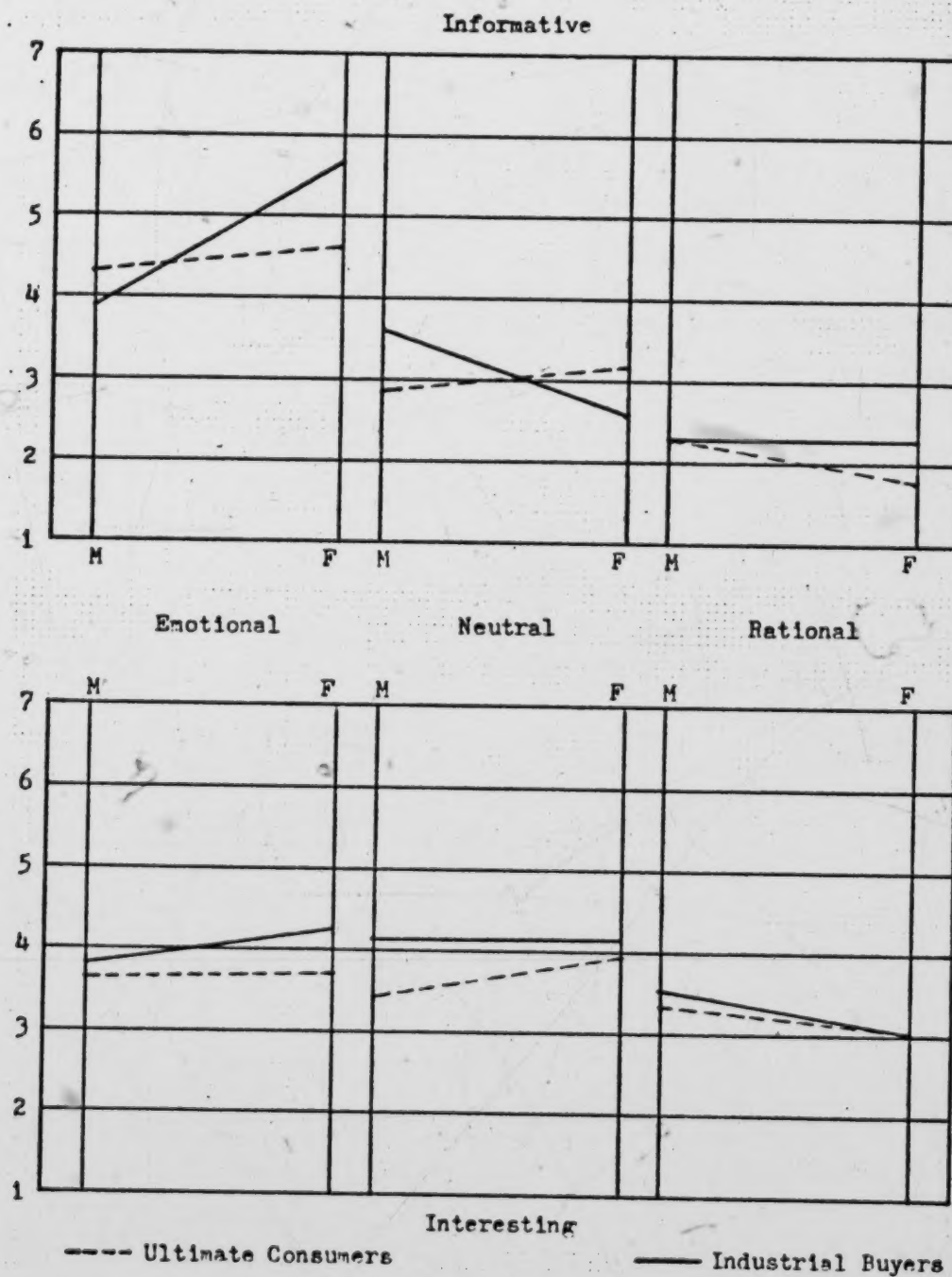


Figure 10: Attitude Mean Scores of the Four Groups Across the Clear and Attractive Scales

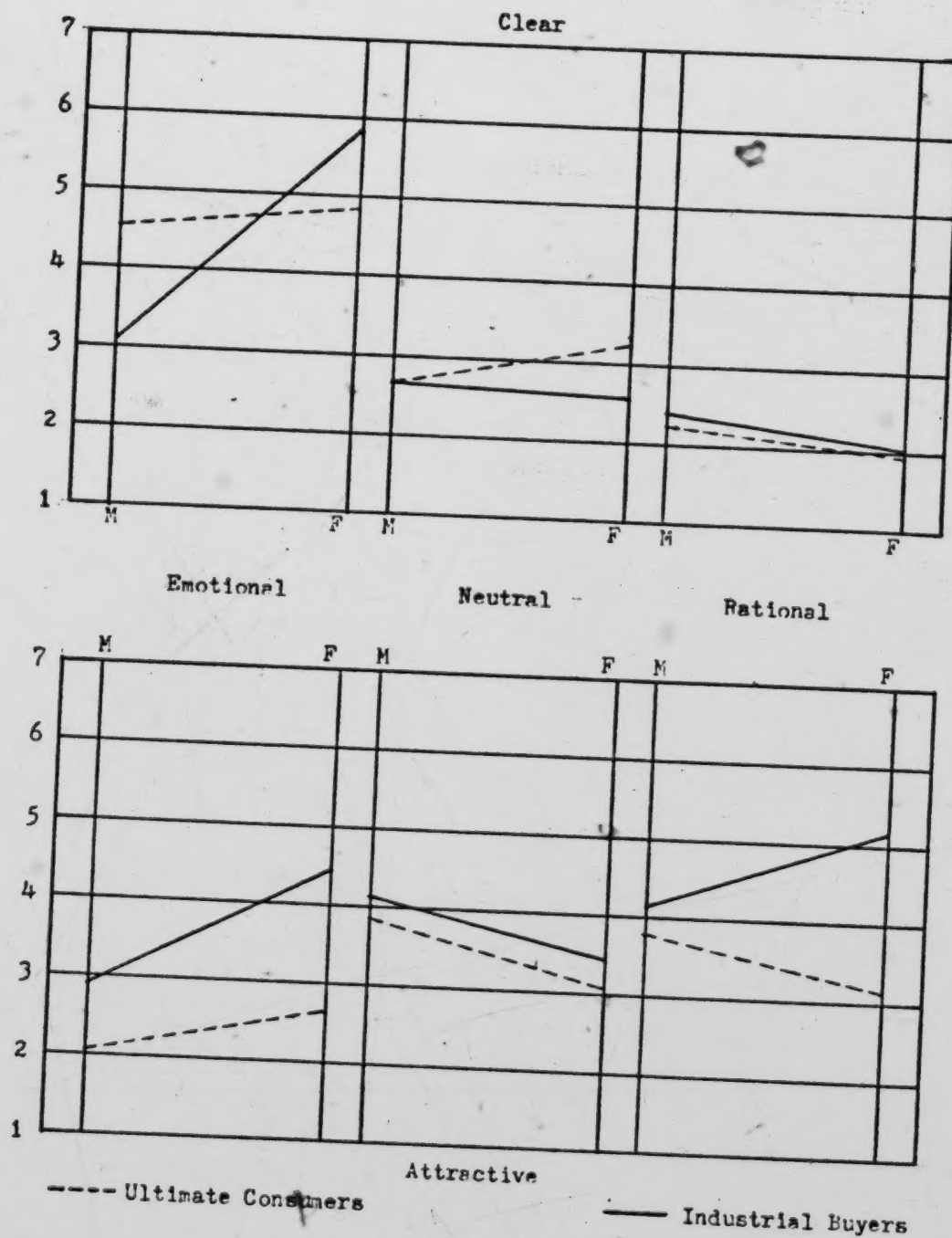
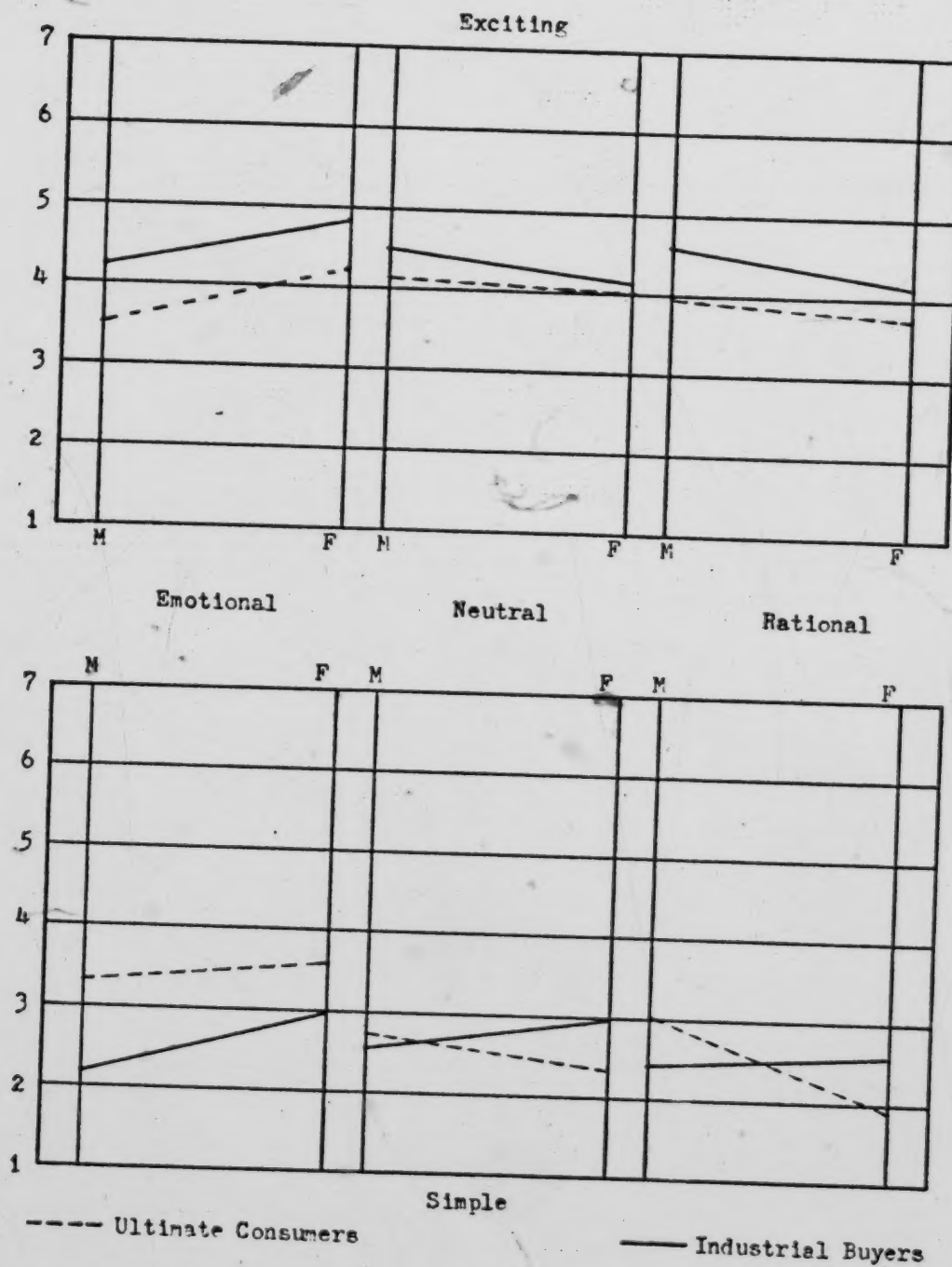
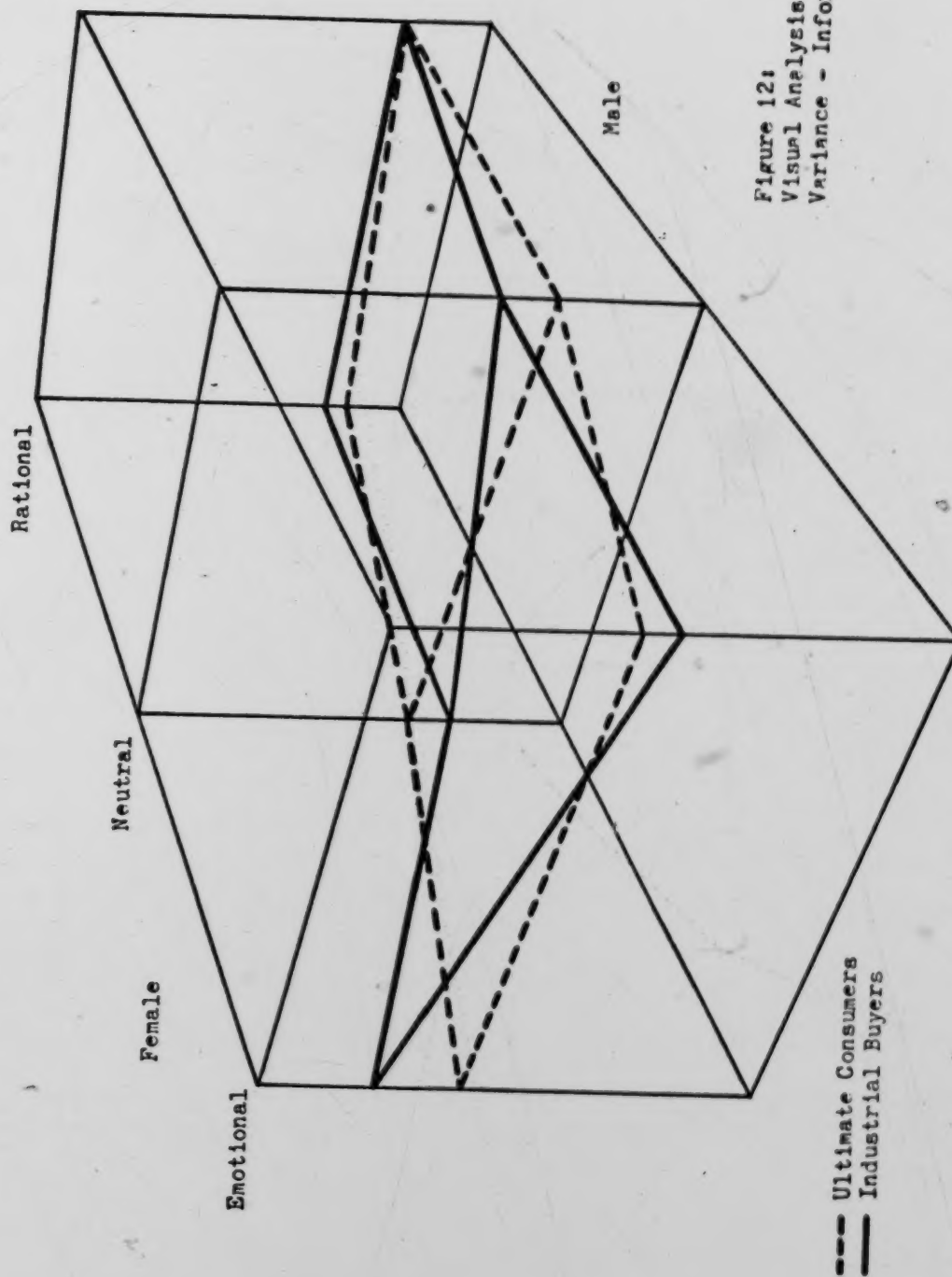


Figure 11: Attitude Mean Scores of the Four Groups Across the Exciting and Simple Scales





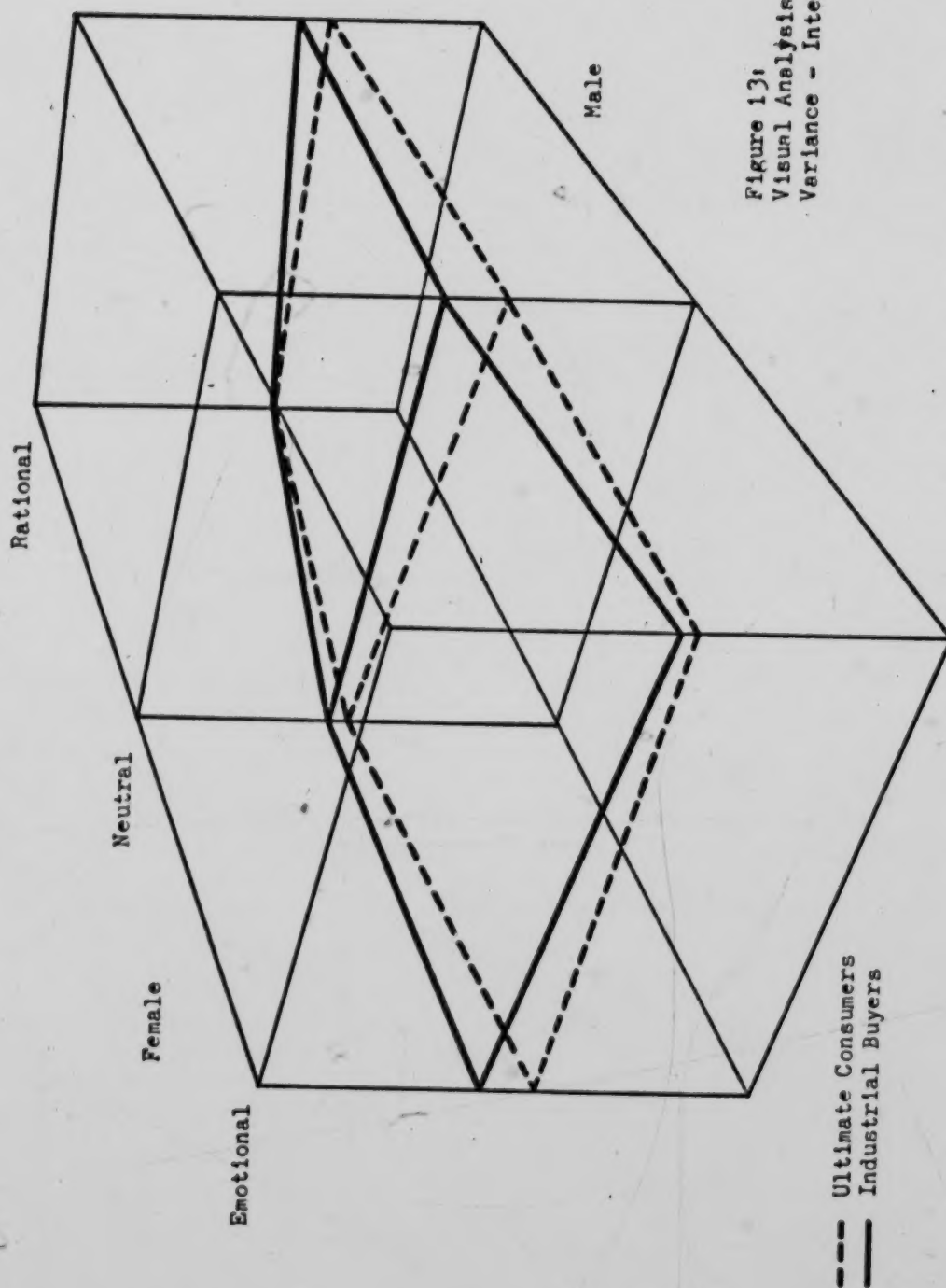
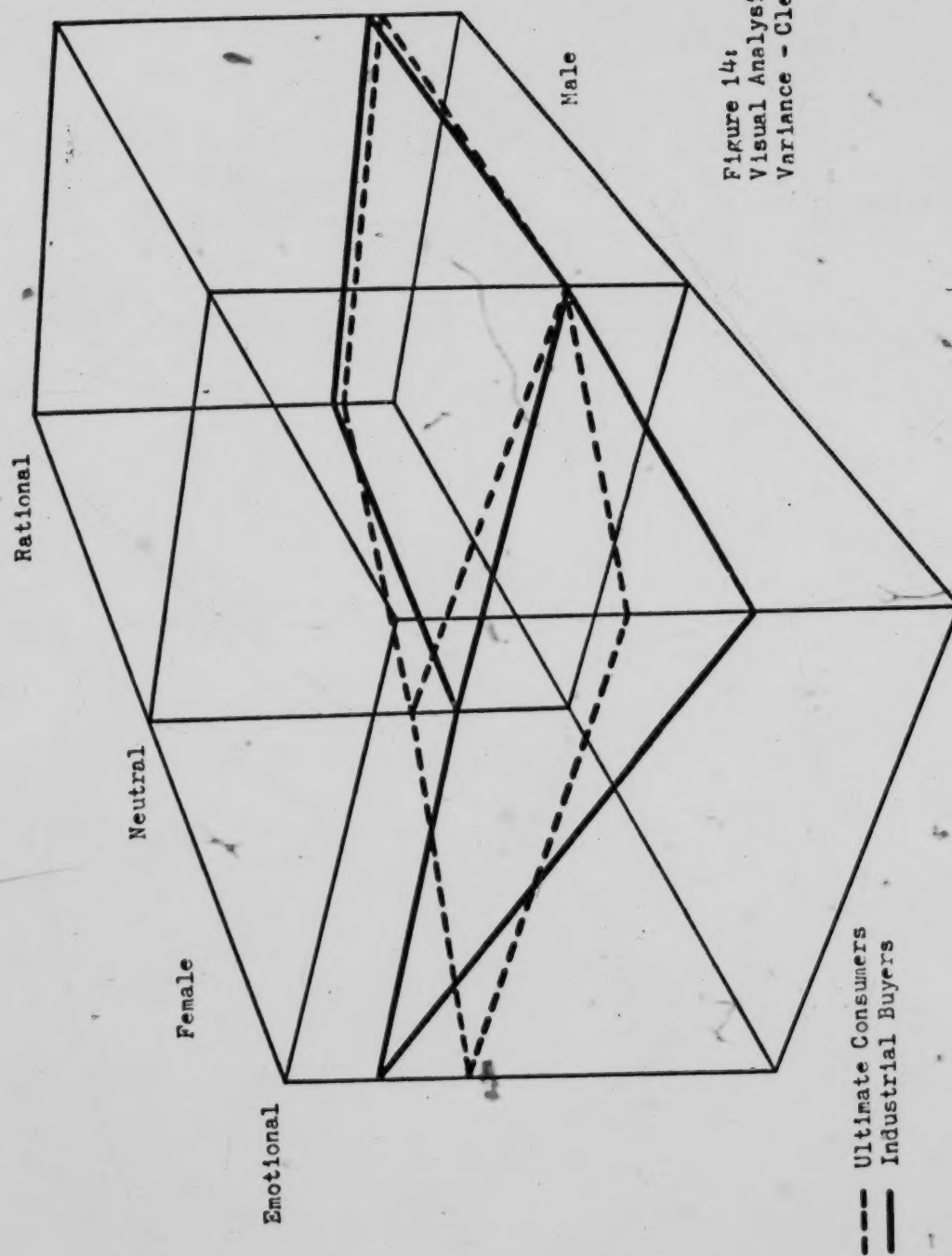


Figure 13:
Visual Analysis of
Variance - Interesting



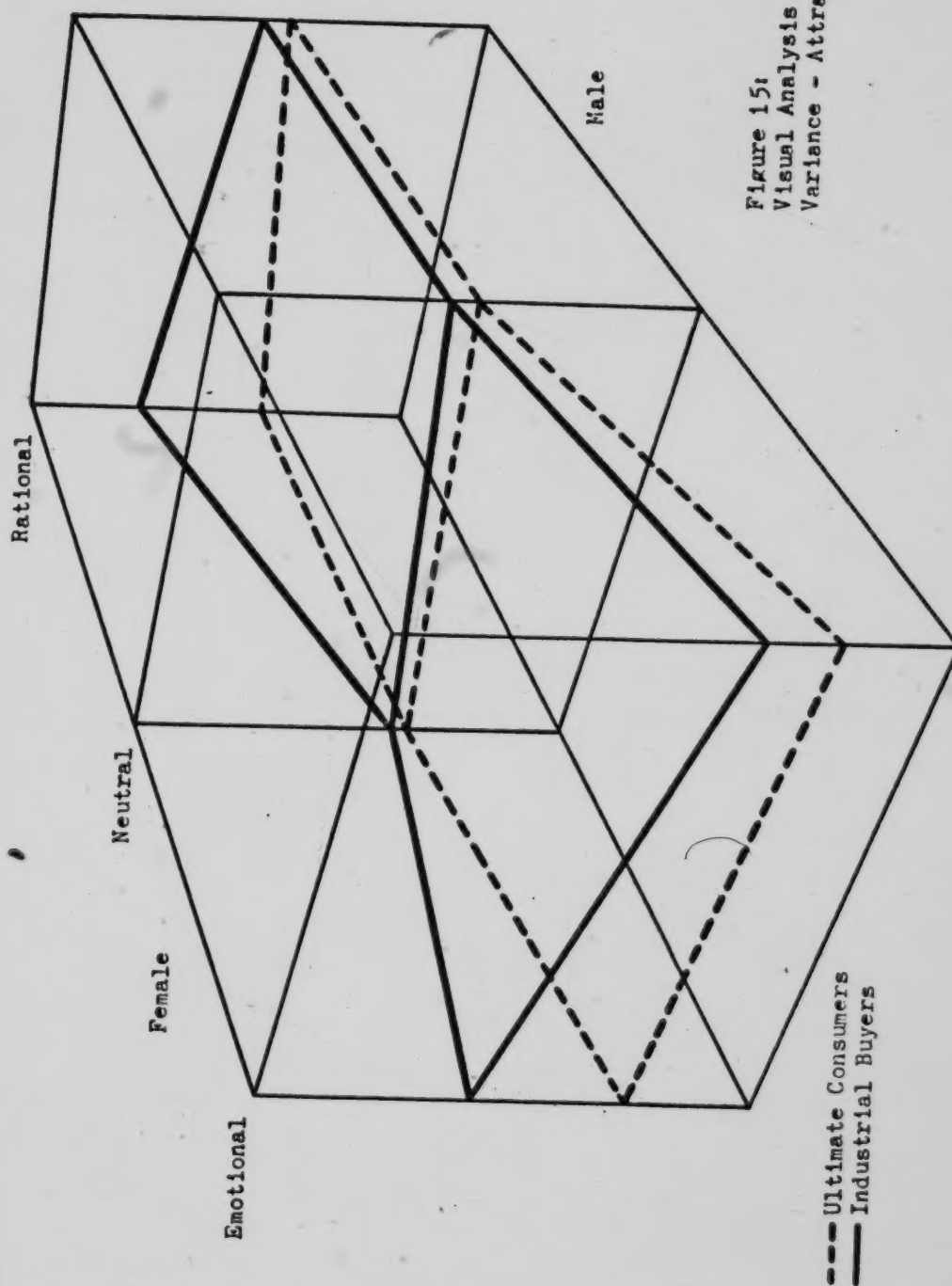


Figure 15:
Visual Analysis of
Variance - Attractive

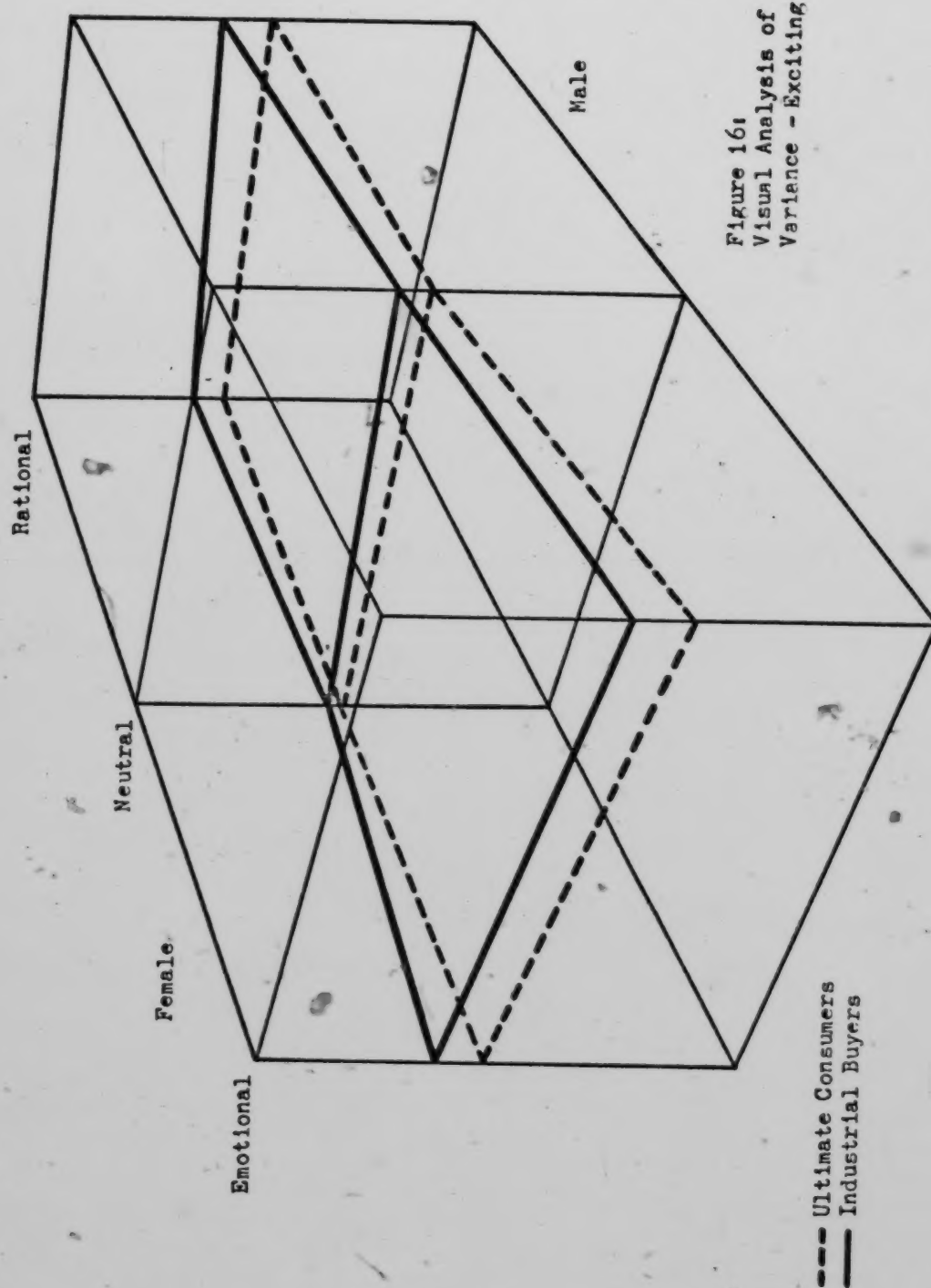


Figure 16:
Visual Analysis of
Variance - Exciting

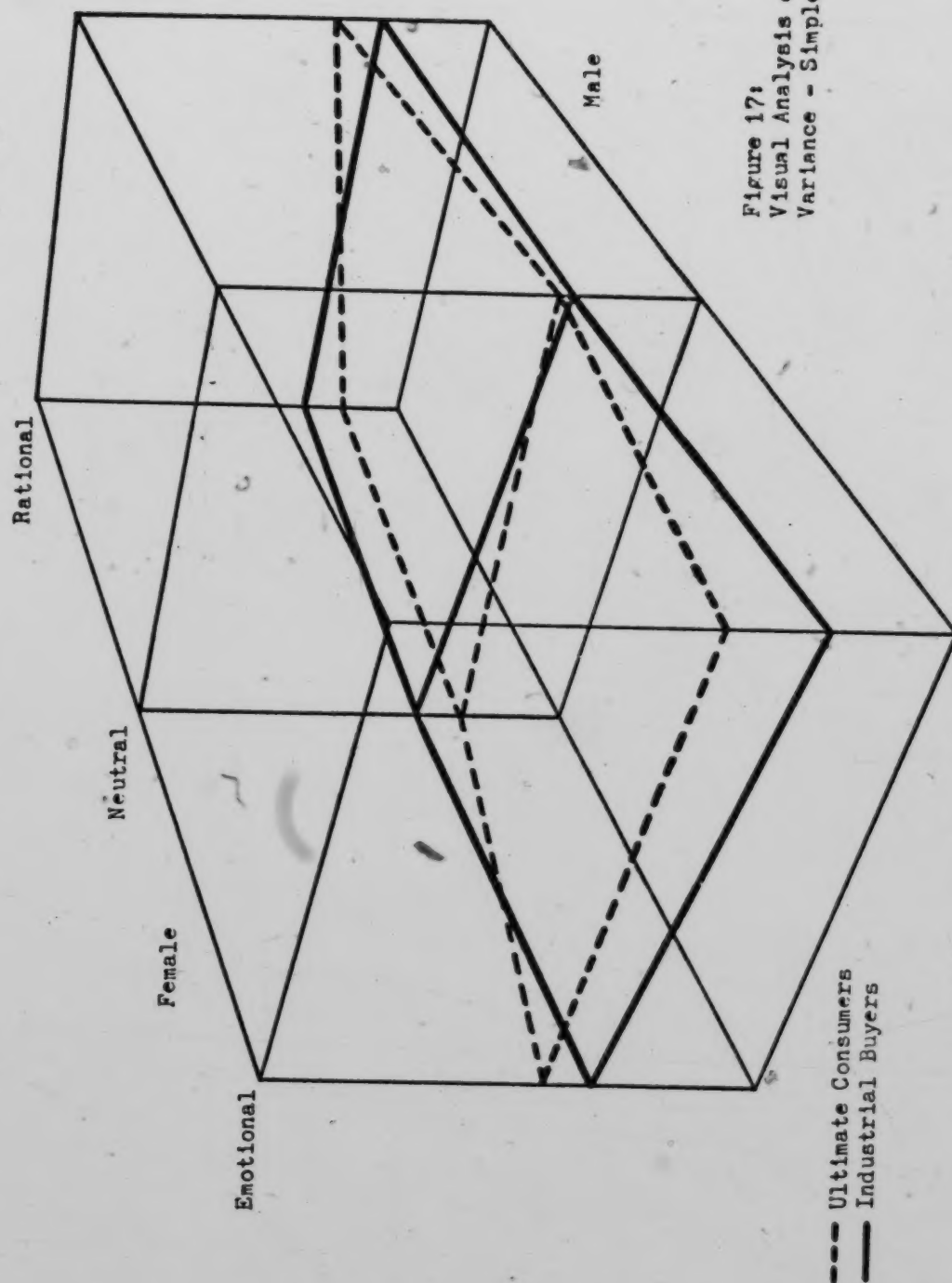


Figure 17:
Visual Analysis of
Variance - Simple

Essentially these figures present the same information as the preceding figures but with an emphasis on the visual analysis of variance.

Simultaneous Comparison of the Linear Compound
of Means Within Groups

As a preliminary test for determining the variation in the attitude scores between groups, a comparison of mean attitude scores between advertisements within the groups was performed. This test was run to account for the possible reasons for variation between the groups. That is, if it was found that either sex or group differences were responsible for differences in attitude scores, a reason for this variation could be partially accounted for by extreme variation within the groups with respect to their perception of the equality of the advertisements. The program was part of the Division of Educational Research Services (TERS) of the Statistical Packages for the Social Sciences (SPSS) programs. (A description of the program, MULV 06, is found in the Appendix.)

The sample was divided into the following groups: male industrial buyers, female industrial buyers, male ultimate consumers and female ultimate consumers. The six scales of the semantic differential are referred to as informative, interesting, clear, attractive, exciting and simple. The hypotheses of this test stated that for each of the four

groups, the individual scale means are equal across the emotional, neutral and rational advertisements.

Statistically the test is of the form:

$$H_0 = \mu_1 = \mu_2 = \mu_3$$

for each of the six scales and each of the four groups.

There were twenty-four tests which were computed using the following equations:

$$H_0 : \mu_1 - \mu_2 = 0$$

$$H_0 : \mu_1 + \mu_2 - 2\mu_3 = 0$$

The results of the tests are shown in Table I. F-ratios were used to test the above hypotheses. It was found that for each group and each scale, the hypotheses were accepted. That is, there was no significant difference in the mean scores of the scales between advertisements within the groups. The mean scores obtained were thus significantly correlated for the three advertisements. Figures 9 through 12 present this information (in all figures, except as where noted, solid lines represent industrial buyers, dotted lines represent ultimate consumers). Visually, it would appear that there are substantial differences in the mean scores between advertisements. A good example to explain the apparent conflict, is to consider the female industrial buyer's score on the clear-vague scale.

TABLE I
SIMULTANEOUS COMPARISONS OF THE MEANS
WITHIN GROUPS--CALCULATED F-RATIOS

	Male Industrial Buyer	Female Industrial Buyer	Male Ultimate Consumer	Female Ultimate Consumer
INFORMATIVE				
$\mu_1 - \mu_2 = 0$	1.33937	2.31260	.126219	.173642
$\mu_1 + \mu_2 - 2\mu_3 = 0$	.04658	.014512	.181995	.268555
INTERESTING				
$\mu_1 - \mu_2 = 0$	.058414	.063377	.223916	.041565
$\mu_1 + \mu_2 - 2\mu_3 = 0$	.070042	.487528	.211628	.136284
CLEAR				
$\mu_1 - \mu_2 = 0$	2.15822	2.32563	.660639	.0898681
$\mu_1 + \mu_2 - 2\mu_3 = 0$	1.10330	.446828	.0130206	.898074
ATTRACTIVE				
$\mu_1 - \mu_2 = 0$	.163825	.579732	.973895	1.01917
$\mu_1 + \mu_2 - 2\mu_3 = 0$	.000127	.305996	.082161	.160260
EXCITING				
$\mu_1 - \mu_2 = 0$	.073622	.153470	.466097	.264279
$\mu_1 + \mu_2 - 2\mu_3 = 0$	.162391	.174387	.019713	.299147

TABLE I (Continued)

SAMPLE	Male Industrial Buyer	Female Industrial Buyer	Male Ultimate Consumer	Female Ultimate Consumer
$\mu_1 - \mu_2 = 0$	1.62140	.046666	.111636	.810721
$\mu_1 + \mu_2 - 2\mu_3 = 0$	.347958	.015105	.160481	1.10038
	$F_{t.05} = 2.92$	$F_{t.05} = 6.59$	$F_{t.05} = 3.24$	$F_{t.05} = 3.16$

Figure 10 shows that as this group views the emotional advertisement and then the neutral advertisement, their mean attitude score drops from 5.8714 to 2.57143. The calculated F-ratio for this particular test is 2.32563 which does not indicate a rejection of the hypothesis. This is due mainly to the small sample size. (The tabulated F-ratio for degrees of freedom of $DF_1 = 3$ and $DF_3 = 4$ is 6.59 at the 5% confidence level.)

The reasons for the relative dependence between the advertisements may be accounted for in two ways. First, respondents may have become conditioned to the subject of the advertisements and responded in a similar manner to all of them, despite the difference in appeals. Second, the same six word-pairs were answered three times, which despite the randomized scales, indicates respondents may have compared the scales between advertisements instead of treating each exposure independently.

These results do not invalidate the advertisements as reliable test instruments. If the instruments were perfectly correlated with each other (i.e. completely linearly dependent) then there would be no need to use more than one advertisement. But the dependency between the three advertisements is only partial. The acceptance of the hypotheses of equality of means across the advertisements is an indication that the interest level for the three advertisements is approximately the same. (Ferber's guide-

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line for designing advertisements of equal interest has thus proven to be well defined.) The absence of a zero, (or close to zero), correlation between advertisements, is useful when considering the sex and group effect between groups. All persons within groups will be considered in the subsequent analyses as regarding the advertisements as being of equal interest. Thus any difference between groups cannot be accorded back to a significant difference in mean scores within each group.

It is important to understand that this was a test for the equality of means between advertisements, within groups. If, and only if, the within group comparison of advertisements and the between group comparison are not significantly different, then the advertisements would be invalid research instruments. The following sections describe the tests for group effects and for significant differences of between group means.

Two Way Multivariate Analyses of Variance Between Groups

There are three hypotheses tests which will provide information as to the source of the variance between groups. The following hypotheses are set up.

H_A : there are no sex differences, or the sex effect vectors are null ($A = 0$)

H_B : there are no group differences, or the group vectors are null ($B = 0$)

H_{AB} : there are no interaction effects between sexes and groups, or the interaction vectors are null ($AB = 0$).

A significant effect is present if the difference between the industrial group mean and the consumer group mean depends on the sex, or if the difference between male and female means, depends on the group.

The program, MULV 10, which was used was from the DERS package and is outlined in the Appendix. The first program was run using the following formula for testing the hypotheses.

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \end{bmatrix} + \begin{bmatrix} \beta_1 A_1 \\ \beta_2 A_2 \\ \beta_3 A_3 \end{bmatrix} + \begin{bmatrix} \gamma_1 B_1 \\ \gamma_2 B_2 \\ \gamma_3 B_3 \end{bmatrix} + \begin{bmatrix} \partial_1 A_1 B_1 \\ \partial_2 A_2 B_2 \\ \partial_3 A_3 B_3 \end{bmatrix} + \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \end{bmatrix}$$

The equality of the three advertisements was first tested using all six scales simultaneously. This resulted in a test for zero sex, group or interaction effects for what was in effect, eighteen variables. If it was found that there were no effects (i.e., the hypotheses were accepted), then further data analysis would not be required. This would have meant that all variables, (scales) for each advertisement were not affected by group or sex differences. However, as shown in Table II, the hypotheses that the sex, group and interaction vectors are null, were rejected. Visually presented, Figure 7, shows the same results.

TABLE II
TWO-WAY MULTIVARIATE ANALYSIS
OF VARIANCE USING THE SIX SCALES SIMULTANEOUSLY
(Calculated F-Ratios)

Test for Sex Effect Vectors Null

$$F = 2.25693$$

Test for Group Effect Vectors Null

$$F = 2.06086$$

Test for Interaction Effect Vectors Null

$$F = 1.90097$$

The tabular F-ratio for $DF_1 = 18$ and $DF_2 = 59$ is approximately equal to 1.78.

Therefore the hypotheses that the effect vectors = 0 are rejected.

TABLE III
TWO-WAY MULTIVARIATE ANALYSIS OF VARIANCE USING
THE SIX SCALES INDEPENDENTLY
(Calculated F-Ratios)

	Informative	Interesting	Clear	Attractive	Exciting	Simple
Sex Effect = 0	<u>3.05237</u>	.413047	<u>5.92597</u>	<u>4.20855</u>	.642272	.533167
Group Effect = 0	1.26953	.217965	1.42735	<u>5.59016</u>	.416412	.908423
Interaction = 0	2.2522	.227776	<u>3.82561</u>	1.91801	.048116	1.32630

The tabulated F-ratio for $DF_1 = 3$ and $DF_2 = 74$ is approximately 2.74.

The F values which reject the hypotheses are underlined.

It was necessary to determine the scales for which the effect vectors are not null and for those which possibly are null. To achieve this, the same program was run, this time for each scale, independent of the other scales. Thus, there were six tests for the value of the effect vectors which tested the three advertisements simultaneously. The statistical formula as presented in the previous test was the theory underlying the testing of each scale.

The details of the results are presented in Table III. A summary of the hypotheses tests is presented below for the six scales.

	<u>Informative</u>	<u>Interesting</u>	<u>Clear</u>
Sex Effects			
Are Null	<u>REJECT</u>	ACCEPT	<u>REJECT</u>
Group Effects			
Are Null	ACCEPT	ACCEPT	ACCEPT
Interaction Effects			
Are Null	ACCEPT	ACCEPT	<u>REJECT</u>

	<u>Attractive</u>	<u>Exciting</u>	<u>Simple</u>
Sex Effects			
Are Null	<u>REJECT</u>	ACCEPT	ACCEPT
Group Effects			
Are Null	<u>REJECT</u>	ACCEPT	ACCEPT
Interaction Effects			
Are Null	ACCEPT	ACCEPT	ACCEPT

A consideration of Figures 6 and 7 will facilitate the interpretation of these results. The advertisements were tested simultaneously, therefore the above results do not pinpoint the variance. Figures 12 through 17 are helpful in visualizing the source of the variance.

1. Informative-Uninformative Scale

The analysis determined that the difference in sexes was the source of the variance in the subject's evaluation of the information content of the advertisement. Figure 7 shows that females ranked more favourable the emotional advertisement's information value than did males, and ranked less favourable the rational advertisement's information value. Figure 12 confirms the source of the variance by the high degree of rotation of the plane representing industrial buyers relative to the plane representing ultimate consumers. The reason for the sex effect was not due to the group to which the sample members belonged. (The interaction effect vector was null.) Figure 6 shows that the group effects are null, that is, there is no significant difference between ultimate consumers and industrial buyers in their evaluation of the information values of the three advertisements.

2. Clear-Vague Scale

Figure 14 confirms the results of the analysis of the clear scale. The rotation of the industrial buyer's

- plane relative to the stable state of the ultimate consumer's plane indicates a significant variance between groups. However, this variance is not caused by the group effects, but is rather due to the sex effect. This difference between sexes is, however, dependent on the group that the person belongs to, as the interaction effect vector is rejected as being null. Most of the variance is due to the female criticism of the emotional advertisement's clarity relative to the male evaluation.

The interpretation of this result is that females will only rank unfavourably the clarity of the emotional advertisement when they are acting as members of the industrial buying group. Another significant source of the variance is the difference in evaluation of the emotional advertisement's clarity between male ultimate consumers and male industrial buyers. As the interaction effect is statistically significant, males will evaluate the clarity of the emotional advertisement more favourably only when they are members of the industrial sector. The lack of parallelism between the planes indicates and confirms the interaction effect. This lack of parallelism is also shown by Figure 12, with respect to the evaluation of the information scale by industrial buyers. However, it is not sufficiently "twisted" enough, relative to the plane of ultimate consumers, to be statistically significant. Figures 9 and 10 also confirm this

observation in two dimensions. The interaction effect is shown on the clear scale of the emotional advertisement by the characteristic crossing of the two lines to a considerable degree.

3. Attractive-Unattractive Scale

Figure 15 visually demonstrates the source of the variance accounted for by sexes and groups. (Figure 8 can also be used to demonstrate the source of variances in two dimensions.) There was a significant difference between males and females and between ultimate consumers and industrial buyers in their evaluation of the attractiveness of the advertisements. Large variations of the mean scale scores are shown for all three advertisements. Ultimate consumers consistently ranked the attractiveness of the advertisements more favourably than industrial buyers. Also, males evaluated the attractiveness more favourably than females. However, the sex effects were independent of the group effects as shown by the relative parallelism of the planes. (The calculated interaction effect was found to be null.)

4. Interesting-Boring, Exciting-Dull and Simple-Complicated Scales

All sex, group and interaction effect vectors were found to be null. That is, there was no significant variance between the evaluations of males and females,

and industrial buyers and ultimate consumers for these scales. Figures 13, 16 and 17 visually demonstrate these findings. The planes remain relatively stable for the three scales as the respondents evaluated the three advertisements. The small variance indicated was not found to be significant.

Summary

The foregoing analysis of variance was successful in determining significant variance between ultimate consumers and industrial buyers on the attractive-unattractive scale only. (This scale was also evaluated differently by males and females.) The analysis was also successful in showing that the variances of other scales were not due solely to group effects but were also due to sex effects. Also, the sex effect on the clear-vague scale was caused by the group to which individuals belonged (i.e., there was an interaction effect).

The above results serve as guidelines for drawing meaningful conclusions. The various graphs have proven valuable in determining the source of the variance. (This was especially helpful as the three advertisements were tested simultaneously in the analysis of variance program.) As the interpretation of graphs is somewhat subjective in the evaluation of the results, discriminant analysis was performed to reveal any errors in the visual interpretation.

Discriminant Analysis

The discriminant mean scores which were derived did not provide any further clarification of the source of the variances. As such, it did not provide further insight for the solution to the problem as stated in Chapter 1. The information was found to be beyond the parameters of the data analysis specified for providing clarification of the differences between groups of scale evaluations. The two-way multivariate analysis of variance used in conjunction with the visual presentation of the attitude score means provide an extensive analysis of the data to enable a full evaluation of the hypotheses.

Analysis of the Open-Ended Questions

The answers obtained from the open-ended questions were generally quite detailed and willingly expressed by the respondents. The topic of "advertising" seemed to be a contentious issue for the majority of the sample. A few people wished to express their views about television advertising or more particularly, the very poor quality of it. However, to entertain views expressed with reference to television advertising would depart from the purpose of the study, that is, to research only attitudes toward print advertising. One view was expressed that this particular study is too traditional by only studying print advertising, and that the "future" of advertising is

through the medium of television. Only the responses which referred to print advertising in particular were included in the analysis.

Ultimate Consumers

The first part of question 1 was: 'Do you feel that the print advertising which you see in your home is satisfactory? Only fifteen percent of the sample expressed an unqualified yes. Another fifteen percent qualified their "yes" response by expressing both pros and cons of advertising resulting from the query in the second part of the question. The remaining seventy percent of the sample listed various reasons why the print advertising they saw was not satisfactory. One of the most common responses was that some advertising was misleading, especially when the advertisement gives one impression of the product or service in the headline, and then changes the content of the message in the fine print. Only two ultimate consumers said that advertising was a waste of money and, as a necessary evil, should be confined to a special section in the newspaper or magazine. The qualified statements that advertising was satisfactory, generally indicated that print advertising provided enough information but that it could be more attractive. The unqualified "yes" statements did not cite the reasons why advertising was satisfactory. A high negative correlation was found to exist between the latter part of question 1

(why print advertising is not satisfactory) and question 2 "What would you like to see in an ideal advertisement?"

The faults of print advertising expressed for the first question were found to be the areas which could be most improved upon as expressed in question 2. The answers were grouped into seven categories--information value, attractiveness, simplicity, excitement, interest, clarity and "others". Using terms common to the study would facilitate the interpretation of the two attitude measuring instruments. Fifty percent of the respondents indicated that information was important. Of this group, thirty percent, (of the 50%), specified that facts, including prices, were important, and five percent would like technical information given about the product. Fifty percent of the group did not mention "information" as being included in an ideal advertisement.

Sixty percent of the sample would prefer to view attractive advertisements. All of these answers mentioned the use of colour as being important as well as a generally good visual appearance.

Only ten percent mentioned an advertisement should be simple and five percent said it should be exciting. Of the thirty percent of the sample that specifically mentioned that an advertisement should be interesting, one-half of this group said they would have to have a "need" for a product before they would read an advertisement.

Truth and realism were also cited as good features of advertisements. Ten percent of the responses were grouped as expressing a need for clarity in the messages presented.

"Other" important answers were few in the ultimate consumer sample, as most answers were able to be grouped into one of the first six categories. Two additional comments are important for the answers received to the questions. First, ultimate consumers were very critical of misleading advertising. Secondly, females expressed a greater desire relative to males for advertisements to present prices and give facts about products and services. Ultimate consumers were eager to express their views about advertising in general, as well as specifically for print advertising. Generally, the views expressed were valid answers to the questions asked, as respondents seemed to express a genuine interest in the experiment.

Industrial Buyers

Similarly, as found when questioning ultimate consumers, industrial buyers were also willing to express their views on print advertising.

Twenty-five percent of the respondents said that print advertising in their environment was generally satisfactory. However, fifteen percent said that it was dull and generally poor. Also, as with ultimate consumers, industrial buyers expressed their answers to question 2 conversely to the faults they expressed in advertising in

question 1.

Sixty-five percent of the sample said that information about the product was important. However, forty-five percent of these people stated that they did not want the advertisement to be overly informative for two reasons. They do not have time to read lengthy copy and if serious thought is given to acquiring the product, detailed and relevant information can be obtained from a representative of the firm. Five percent said they would like to see a price estimate and five percent said they would not.

Twenty-five percent of the sample, explicitly stated they would like advertisements to be interesting, and of these people, seventy-five percent said they would only be interested in the advertisement if the product or service could fulfil a need requirement.

Fifteen percent cited clarity, five percent mentioned excitement and fifteen percent said simplicity was important in advertisements.

Fifty-five percent of the sample said that advertisements should be attractive with ninety percent of these people specifying good visual appeal as important. (The use of colour was frequently mentioned.) Ten percent of the sample mentioned that it did not matter how attractive advertisements were and fifteen percent accused advertising of being a waste of money. These people indicated that they derived most of their information from salesmen

and said that advertising budgets should be channelled into improving personal selling. One person mentioned that the type of paper which the advertisement was printed on was an important consideration. Reading long copy on glossy paper reduced this person's attention span for the advertisement because of annoying glare.

Males and females expressed relatively the same views about the attributes of an ideal advertisement.

Summary

The open-ended questions served to obtain responses from the sample which would provide further insights into the differences in attitudes toward advertising of ultimate consumers and industrial buyers. Analyzing the answers as categorized, it is more meaningful to compare the similarities between the two groups.

Fifty percent of ultimate consumers valued information in advertisements and seventy percent of this group wanted advertisements to include facts, especially prices. Only fifteen percent more industrial buyers than ultimate consumers explicitly stated that information about the product was important and of this group, nearly half did not want too much information presented.

Approximately the same percentage of industrial buyers and ultimate consumers stated that they would only look at an advertisement if there was a need to be met by the advertised product or service.

Fifty percent of ultimate consumers stated that advertisements should be attractive (with an emphasis on the use of colour) and just five percent more industrial buyers expressed the same view.

The severest criticism expressed by ultimate consumers was that of encountering false advertising. Industrial buyers criticized the worth of advertising. It was those buyers that viewed industrial advertising as being dull who raised the above point.

Thus, there is a similarity between ultimate consumers and industrial buyers in their attitudes toward advertising. The nature of rational/irrational appeals in advertising can be inferred from the relatively high concern for information value and attractiveness of both groups. This inference will be considered in the next chapter.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Evaluation of the hypotheses

The hypotheses as stated in Chapter 1 are restated here.

Hypothesis 1: Print advertising messages should stress a rational appeal for industrial buyers and an emotional appeal for ultimate consumers for similar goods and services which are purchased by both groups.

Hypothesis 2: Print advertising messages should stress neither a rational appeal nor an emotional appeal, but rather a combination of the two appeals, for similar goods which are purchased by both industrial buyers and ultimate consumers.

Both the attitude scales and the open-ended questions provided significant data for evaluating the hypotheses.

An inspection of Figures 6 and 7 shows the similarity of mean attitude scores between groups for the rational advertisement and particularly for the neutral advertisement. Much of the variance between groups was caused by the attitude mean score differences for the emotional advertisement. (The three dimensional representations of the data, Figures 12 through 17, show that the significant rotation of planes occurred in the "first half" of the cubes, indicating variance present in the evaluations of the scales on the emotional advertisement.)

The equality of means within groups proved to be of significant value when interpreting the differences in means between groups. Thus the variance caused by group or sex effects was not attributable to observed inequalities of means within the groups. In other words, the degree of heterogeneity between ultimate consumers and industrial buyers could not occur as a result of the homogeneity within the groups.

The only significant group effect was found to account for the variance between advertisements on the attractive-unattractive scale. Figure .8 shows that ultimate consumers rank all three advertisements more favourably than do industrial buyers. It cannot be argued that the advertisements are more appropriate for ultimate consumers than for industrial buyers on this scale alone. If this were the case, the evaluation of the other scales would reflect a significantly more favourable mean score as well.

Further insight into the evaluation of the hypotheses is obtained by considering, that for five scales, there was no significant difference between ultimate consumers and industrial buyers. Again referring to Figure 8, a visual representation of differences between groups is given. The two groups evaluated the information content of the advertisements in very much the same way. This is a most important observation. If emotional appeals were favoured by ultimate consumers, then the scale should be ranked



favourably for the emotional advertisement, and unfavourably for the rational advertisement. This would be shown by a dotted line (ultimate consumers) passing upwards from left to right intersecting the solid line (industrial buyers), approximately at the evaluation of the neutral advertisement. However, this is not the case. Both industrial buyers and ultimate consumers evaluate the rational advertisement favourably relative to their evaluation of the emotional advertisement (the neutral advertisement is ranked approximately midway between the two extremes). Considering the other scales simultaneously with the evaluation of the informative scale, provides a good insight for marketers. Using an emotional appeal alone results in an unfavourable evaluation of the (emotional) advertisement on the informative scale for both groups. Interest in the advertisement and the degree of excitement about the message do not rank as favourably as the other scales. (These scales, however, do not rank as favourably for all three advertisements.) The emotional appeal lacks clarity, especially in the ultimate consumer sector and is also ranked as being complicated relative to the other advertisements by ultimate consumers. However, this advertisement was evaluated as being attractive relative to the other advertisements.

This brings to the surface one of the most perplexing problems encountered in advertising; how to create rational

and informative advertisements without forsaking attractiveness. The answers to the open-ended questions prove that this problem has not been solved. The results of this experiment are consistent with the real world situation as perceived by ultimate consumers and industrial buyers. Much emotional advertising is attractive, yet lacks clarity and does not provide a satisfactory amount of, nor the correct type of information. On the other hand, much industrial advertising is informative, clear and simple, yet is not attractive (and is either frequently not read or discarded because of the anticipation of its poor quality). It is interesting to note that industrial buyers rank all advertisements less favourably on the attractive scale relative to ultimate consumers, but the variance between groups is more pronounced when evaluating the rational advertisement.

The effect of differences in sex within the two groups is important to consider. It may be argued that males and females view advertisements differently and may account for the variance between groups. It was not a goal of this study to explicitly study the attitudes of the two sexes, but rather to examine their effect on group differences, where in fact those group differences were significant.

As previously mentioned in the study, it was unfortunate that a larger number of female industrial buyers could not have been included in the sample. Most of the variance accounted for by sex effects was due largely to the deviation from the male's evaluation by this small group. As

the sex effect did not interact with the group effect on the attractive scale, the importance of examining sex effect vectors is lessened. Although the variance between males and females was found to be significant, because of the very small sample, little faith can be put in the generalization that these sex effects are in fact significant. The only other sex difference which can be viewed as significant, was the valuation that females in the ultimate consumer sectors placed on the inclusion of price in the message of the advertisement.

A very important consideration is the similarity of views expressed by ultimate consumers and industrial buyers on the open-ended questions. Information was important, including sufficient facts about the product or service. (Industrial buyers did not want too much information, (1) because of time limitations on the job, and, (2) the final purchase decision is frequently made with the help of a supplier's salesman.) The concern for well designed, attractive advertisements was also similarly expressed. As industrial buyers stated the importance of this variable more often than ultimate consumers, it would indicate a need for more attractive advertisements in the industrial sector.

Using the data derived from the attitude scales and the expression of the characteristics of an "ideal" advertisement the hypotheses can be meaningfully evaluated.

Clearly the first hypothesis is rejected. Advertising messages should not stress a rational appeal for industrial buyers and an emotional appeal for ultimate consumers (for similar goods). The two groups were not significantly different in their evaluation of the attitude scales to make this generalization and expressed relatively the same answers to the open-ended questions.

In evaluating the second hypothesis the neutral advertisement should be examined. Figure 6 shows the similarity of the two groups toward this advertisement which uses both rational and emotional appeals. The extreme appeals in the other advertisements, resulted in a greater proportion of variance with greater frequency and intensity in the emotional advertisement. However, the similarity in the groups evaluation of the information value of the three advertisements must be considered before any generalizations can be made. But, by considering the evaluation of the other scales across the three advertisements, ample information is obtained to evaluate the second hypothesis. As the evaluation of interest in the advertisement was approximately equal across the three messages, it is apparent that the different appeals proved interesting to the two groups. The favourable evaluation of rational information versus the unfavourable evaluation of emotional information is discounted by the equality of interest in, and excitement created by, the advertisements. This would indicate

that although a person in a particular group can judge information value (rational vs. emotional) it does not account for the reasons that the advertisements were nearly all equally interesting and exciting.

Thus the importance of testing several scales is shown to be important.

With the previous analysis it is plausible that the second hypothesis is accepted.

Restated the hypothesis reads: Print advertising messages should stress a combination of rational and emotional appeals for similar goods which are purchased by both ultimate consumers and industrial buyers.

Evaluation of Results

The research was successful in discerning ultimate consumer and industrial buyer attitudes toward print advertising. It was found, that by accepting the second hypothesis, a person's rational and irrational orientation is a function of his interaction between internal and external variables. If this was not the case, the first hypothesis would have been accepted.

The research has shown that the traditional view of "rational" industrial buying and "irrational" or "emotional" ultimate consumer purchasing is not consistent with the findings. The implications for marketers are many.

(1) The roles played by industrial buyers are not as significantly different from their roles as ultimate consumers as was once thought, despite the formal organization's external variables interacting with the individual's internal variables. (2) Attitudes are an important measurable variable of purchasers. The knowledge of these attitudes will provide the message communicator with a fuller understanding of the target audience. (3) Viewing consumers as "bringing something" with them to the communication process will do much to help the communicator design effective messages. The fact that the two groups in this experiment were measured on their attitude scores with respect to three different advertisements, shows that messages are perceived with respect to many variables

interacting within the individual and expressed in the form of attitudes. (4) An understanding of the similarities of ultimate consumers and industrial buyers is useful to determine the optimum appeal in each market. (5) It is possible that future research should take the form of a unidimensional concept of buyers. That is, industrial purchasers and ultimate consumers will be regarded simply as "purchasers". The research will not distinguish between groups, but will rather place purchasers on a continuum of available goods in the market. This design will recognize that there are similarities between the two groups and will provide the tools for determining proper appeals.

Evaluation of the Research Design

The test advertisements were found to be valid stimuli for comparing attitudes between the two groups. The subject of the advertisements did not significantly bias the results. The semantic differential and the open-ended questions were reliable instruments for measuring attitudes. The data was easily obtained and interpreted through the use of the DERS programs.

Future research should be undertaken in two areas:

- (1) across a larger sample of industrial firms to determine if there is in fact, within group variance of attitudes between advertisements (it is suspected there is), and
- (2) in the area of "attractiveness", to determine possible

differences in evaluating attractiveness as a non-static variable.

Summary

The study was successful for two reasons. (1) Further insights into the theory behind advertising were derived. Communicators of messages can benefit from this added knowledge of the audience. (2) The roles of industrial buyers and ultimate consumers were also clarified. A measure of the effects of interaction between external and internal variables for the two groups was determined by the discernment of attitudes (as a unidimensional scale) toward three stimuli.

Communicators should examine their methods of evaluating advertising effectiveness more closely. To design effective messages requires an examination of the receiver of those messages. The simple measures which are now employed are not good enough. This study has shown that audiences can, and should be understood to enable better message design.

The knowledge contributed by this study is believed to be of valuable assistance to marketers in the performance of their very complex tasks.

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APPENDIX

MASTER OF BUSINESS ADMINISTRATION PROGRAM

THE UNIVERSITY OF ALBERTA

ADVERTISING RESEARCH STUDY

The following is a guide to help you judge each advertisement on the basis of your own feelings.

If you feel the advertisement is extremely well described by one of the adjectives at the ends of the scale, please mark as follows:

1 2 3 4 5 6 7
dull _____ X _____ exciting

OR

dull X _____ _____ exciting

If the advertisement is quite closely described by one of the ends of the scale, but not completely so, please mark as shown below:

interesting _____ X _____ boring

OR

interesting _____ X _____ boring

If you feel the adjectives only slightly describe the advertisement, please mark as follows:

uninformative _____ X _____ informative

OR

uninformative _____ X _____ informative

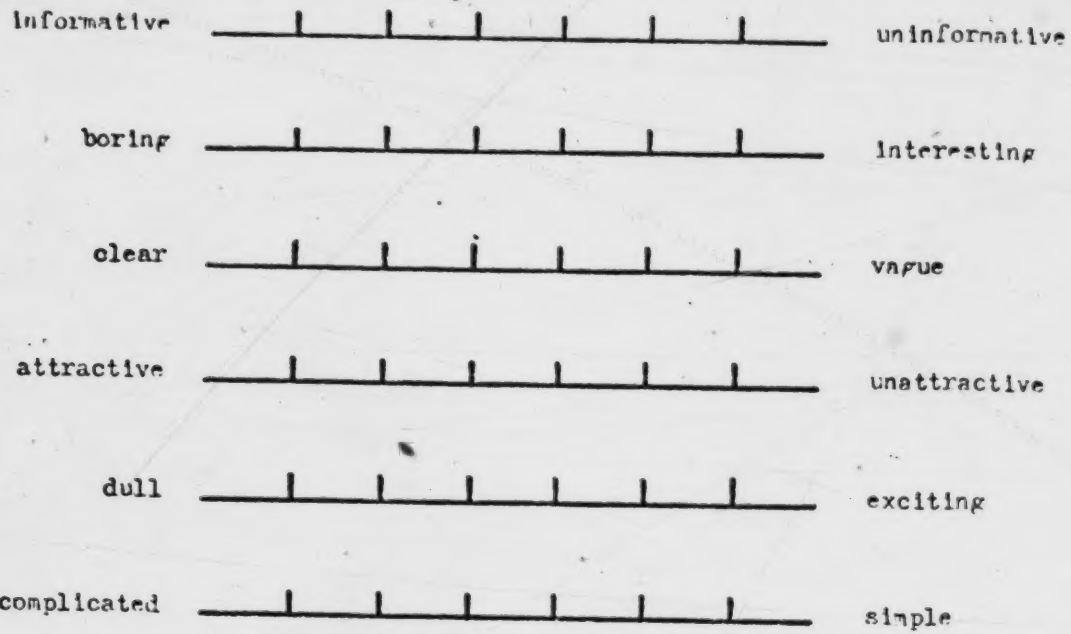
If you consider the advertisement to be equally well described by either adjective, that is you are neutral in your feelings toward it or if the scale seems irrelevant, then please mark as shown below:

attractive _____ X _____ unattractive

Please base your judgments on your first impressions, so do not worry or puzzle over a particular scale. Also, please consider each advertisement independently and do not refer back to previous answers.

Thank you for your time and effort --it is kindly appreciated..

Lowell P. H. H.



1 2 3 4 5 6 7



% Male Workforce in Managerial and Professional Positions
Average total/household

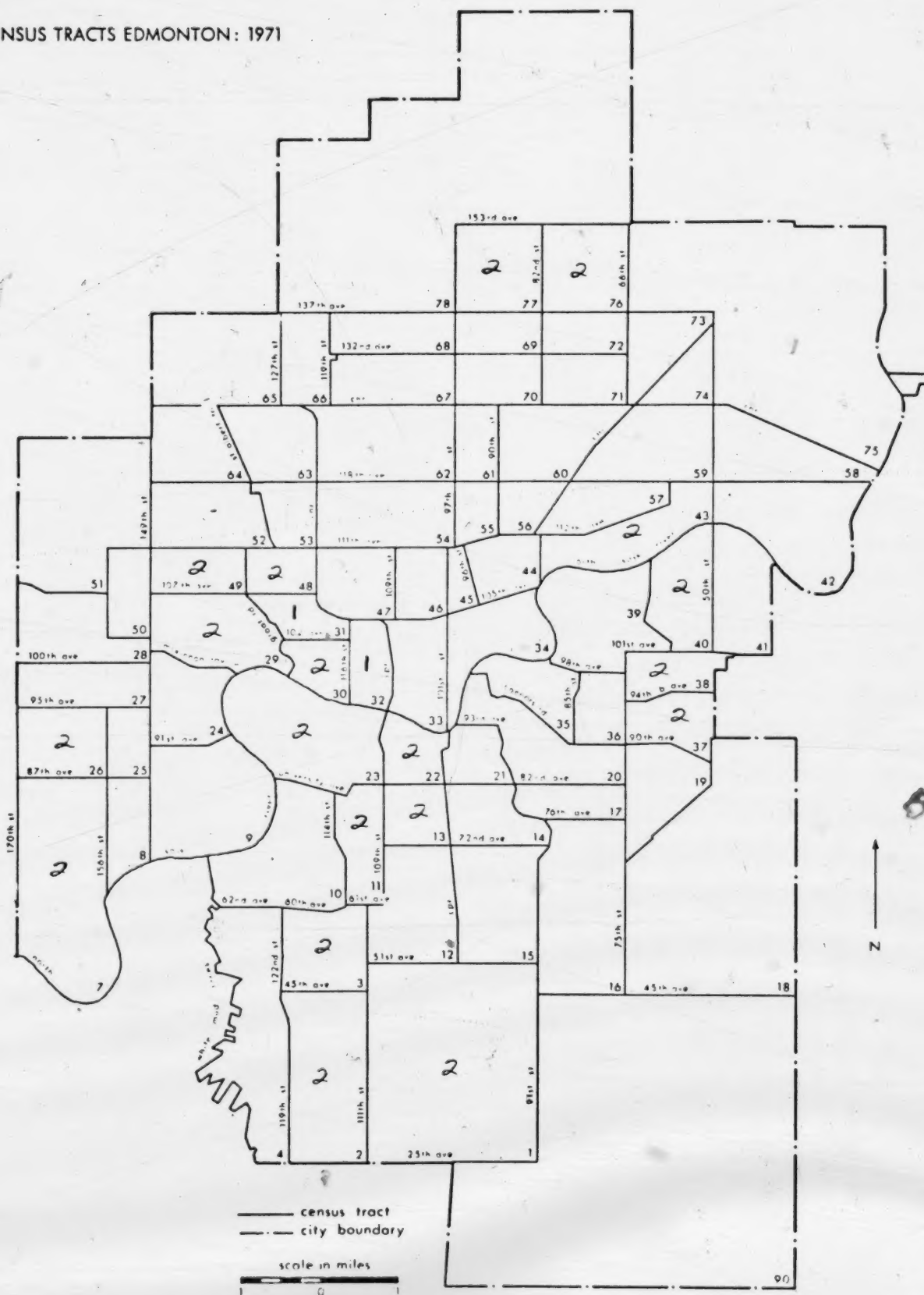
104

			Census tract		
	<u>Occupation</u>	<u>Income</u>		<u>Occupation</u>	<u>Income</u>
1	24.13	11,151	53	13.62	8,506
2	40.2	13,725	54	14.0	9,028
3	39.6	13,972	55	8.3	6,655
4	49.1	18,481	56	4.9	7,341
5	47.4	18,610	57	13.3	9,065
6	12.2	8,213	58	6.6	9,106
7	27.3	12,414	59	6.2	8,697
8	37.4	16,482	60	10.1	8,201
9	41.8	22,348	61	11.4	7,416
10	37.3	18,751	62	13.7	7,815
11	28.2	9,884	63	11.5	9,673
12	18.1	10,207	64	17.2	11,209
13	22.8	8,174	65	12.8	9,914
14	12.6	7,917	66	9.6	9,950
15	12.6	9,236	67	10.5	9,526
16	18.3	11,591	68	13.1	10,762
17	12.1	8,783	69	17.1	11,439
18	0.0	9,516	70	11.1	9,491
19	17.2	10,829	71	9.4	9,373
20	16.1	9,406	72	14.2	11,266
21	19.1	7,952	73	9.9	9,697
22	26.2	8,640	74	0.0	5,666
23	54.8	14,436	75	17.9	10,742
24	36.7	19,117	76	20.7	11,408
25	10.4	8,726	77	22.3	11,844
26	23.2	12,652	78	11.1	9,718
27	15.5	8,931	90	14.4	8,971
28	9.1	9,021			
29	28.2	14,047			
30	29.4	10,574			
31	21.6	8,367			
32	25.1	8,662			
33	21.7	6,222			
34	7.2	5,217			
35	15.3	8,797			
36	19.5	11,587			
37	26.5	12,507			
38	27.1	12,248			
39	14.2	10,186			
40	25.0	14,118			
41	17.9	11,867			
42	10.2	10,327			
43	20.1	10,180			
44	10.4	7,262			
45	5.4	4,304			
46	19.2	7,734			
47	16.4	8,309			
48	20.0	9,225			
49	22.3	11,352			
50	5.8	8,578			
51	10.5	10,766			
52	16.3	9,893			

Class Intervals:

Income (Av. income per household)
Occupation (Percentage professional and
managerial workers)

CENSUS TRACTS EDMONTON: 1971



UNIVERSITY OF ALBERTA
Division of Educational Research Services
Computer Program Documentation

TITLE: ONE SAMPLE HOTELLING T^2 TEST.
MACHINE: IBM 360/67.
LANGUAGE: FORTRAN IV(H).
PROGRAM TYPE: COMPLETE.
SUBPROGRAMS: MXOUT, FISHER, DATA, DMPRD, FST, HOTSIM,
(GSP) CORPE, CONVT, DSINV, GUPRD, LOC, DMFSD.
LIMITS: Dimensioned to accomodate up to 20 variables.
PROGRAMMED/
DOCUMENTED BY: K. BAY.

Description

1. Calculate T^2 by,

$$T^2 = N(\bar{X} - \underline{u})' \underline{S}^{-1} (\bar{X} - \underline{u})$$

where N=sample size

$\bar{X}$ =sample mean vector,

$\underline{u}$ =population mean vector,

$\underline{S}$ =sample covariance matrix.

2. Calculate corresponding F-statistics and test significance.
3. Employing Roy's union intersection approach, perform multiple comparisons of any linear compound of sample means as option.

References

- Morrison D. F., Multivariate Statistical Methods. New York: McGraw-Hill, 1967. P. 117-124.
- Roy, S. N., & R. C. Bose. "Simultaneous Confidence Interval Estimation," Annals of Mathematical Statistics, Vol. 24, 1953. Pp. 513-536.

Preparation of CardsHeader Cards

	Cols.	
Card 1	1-80	Title card. An alphameric description of the data.
Card 2		Parameter card (16I5).
	4-5	NV No. of variables.
	9-10	N No. of subjects in the sample.
	14-15	MULCOM No. of multiple comparisons of the linear compound of sample means (can be zero).
Card 3	1-80	Format for the data (20A4).
Card 4		Population mean vector, read according to above format. (means to which the sample means are to be compared).

Data Cards

Data card must be as described on Card 3.

MULTIPLE COMPARISONS (Repeat following MULCOM times).

1. Title (20A4).
2. Alpha level for confidence intervals (F5.5).
3. Format for weight vector A (20A4).
4. Weight vector A.

Last Card

Processing ceases when a blank card is encountered instead of a title card or an END OF DATA SET (/*) card is sensed. As many "jobs" as required may precede this card.

Output

The following information is output by the program:

1. Population, sample mean vector.
2. Sample D. P. matrix, correlation and covariance matrices.
3. T^2 , D.F., F-ratio, probability level.
4. For each multiple comparison:
 - 1). Weight vector A.
 - 2). T^2 , D.F., F-ratio, probability level.
 - 3). Simultaneous confidence intervals.

UNIVERSITY OF ALBERTA
Division of Educational Research Services
Computer Program Documentation

TITLE: TWO-WAY MULTIVARIATE ANALYSIS OF VARIANCE AND COVARIANCE
FIXED EFFECT MODEL WITH UNEQUAL OBSERVATIONS IN EACH CELL.

MACHINE: IBM 360/67.

LANGUAGE: FORTRAN IV(H).

PROGRAM TYPE: COMPLETE.

SUBPROGRAMS: HYPOTH, RAOFT, ROYTES, MXOUT, FISHER, TRINV, DGMTRA, DMPRD,
MUCOM, FST, EFFECT, CONTR2, DATRAL, DATRAN
(SSP) ARRAY, GMADD, GMPRD, GMSUB, GMTRA, GTPRD, MCPY, MINV,
NROOT, LOC, MSTR, DSINV, DMFSD, EIGEN, XCPY, BDTR, CDTR,
DLGAM, NDTR, CONVT, RCPY.

LIMITS: Currently dimensioned to accomodate up to 20 criteria variates
and 50 predictors which is equal to $MA \times MB + NCOV$ if MODE is
0 or 1, and $MA + MB + NCOV - 1$ if MODE=2.

PROGRAMMED/
DOCUMENTED BY: K. BAY.

Description

This program carries out a fixed effect model two-way multivariate analysis of variance with or without concomitant variables control employing equally or unequally weighted means approach for defining main effects. The program handles equal or unequal number of subjects per cell based on computational procedures outlined in Bay's paper. The user must specify his design by choosing one of the following designs, namely,

- (1) Complete designs with equal weights for main effects, i.e., additivity is not assumed, suitable for most experimental designs;
- (2) Complete designs with specific weights for main effects, i.e., additivity is not assumed, and the user must supply weight systems for both factors. This design is suitable for most survey type designs.
- (3) Additivity model, i.e., interactions are assumed to be absent in the unrestricted model. This design is also called "least square solution" in some cases.

Depending upon the user's choice for the design, the program automatically sets up appropriate design matrix X , and inter-parameter hypothesis matrix C and test hypotheses of the $C B M = 0$ type, where B is parameter matrix and M is inter-variate transformation matrix which must be supplied by the user. The following tests are performed by the program:

- (1) The general mean vector is a null vector.
- (2) Row or 'A' effect vectors are all null.
- (3) Column or 'B' effect vectors are all null.
- (4) If MODE is 1 or 0, all interaction effect or 'AB' effects are null.
- (5) If NCOV is not 0, regression coefficient vector for each concomitant variable is a null vector.

If any one hypothesis on main effects or interactions is rejected, the user can check which parameter or linear combination of parameter-variate may lead to rejection of the hypothesis by using optional multiple comparisons of parameters. However for this option, the user must specify interested contrast of main effects or interactions and variate or linear combination of variates by inputting contrast matrix and inter-variate weight vector w.

References

- Bay, K. Application of Multivariate Analysis of Variance to Educational and Psychological Researches, Part II: Hypothesis Testing by MANOVA Programs. Unpublished Paper, Division of Educational Research Services, University of Alberta, Edmonton, 1969.
- Morrison, D. F. Multivariate Statistical Methods. New York: McGraw-Hill, 1967.
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Preparation of Cards

Header Cards

	Cols.	
Card 1	1-80	Title card. An alphameric description of the data (20A4).
Card 2		Parameters (16I5): NT, NV, NC, NCOV, MODE, MA, MB, NMATM
	1-5	NT Total number of subjects in the sample.
	9-10	NV No. of input variables including two index variables to indicate levels of each factor (usually 2 + NC + NCOV).
	14-15	NC No. of criteria variates.
	19-20	NCOV No. of concomitant variables.
	25	MODE Option for the type of design. 0--Complete design with equal weights. 1--Complete design with specified weights. 2--Additivity assumed.
	29-30	MA No. of levels in factor 'A'.
	34-35	MB No. of levels in factor 'B'.
	39-40	NMATM No. of <u>M</u> transformation matrices.
Card 3-1		Weight vector for factor 'A' (16F5.5).
Card 3-2		Weight vector for factor 'B' (16F5.5).
Card 4	1-80	Format for data cards (20A4).

Card 5s

Data Cards

- (1) Data cards must be compatible with card 4.
- (2) Each READ statement reads (in F format) 2 index variables, NC criteria variates and NCOV concomitant variables. If data card is not punched in this order, DATRAN must be used to rearrange the order.

(Repeat Card 6-17 NMATH times).

Card 6 1-80 Title for M transformation matrix (20A4).

Card 7 4-5 NU, MULA, MULB, MULAB(16I5).
 NU--No. of columns and rank of M matrix.
 MULA, MULB, MULAB--No. of weight vectors for multiple comparisons of parameters for main effects and interactions.

Card 8 1-80 Format for rows of M matrix (20A4).Card 9s Rows of M matrix with above format (NC rows).

(If MULA=0 go to card 16)

Card 10 1-80 Title for contrast coefficient matrix (20A4).

Card 11 1-80 Format for the rows of contrast matrix (20A4).

Card 12s Rows of contrast coefficient matrix, (MA-1) rows.

(Repeat Card 13-15 MULA times)

Card 13 1-80 Title for inter-variate weight vector w (20A4).

Card 14 1-80 Format for the weight vector (20A4).

Card 15 Weight vector of length NU.

Card 16 Repeat Card 10-15 for factor 'B' if MULB is not 0.
No. of rows of contrast matrix is (MB-1).Card 17 Repeat 10-15 for 'AB' interactions if MODE is not 2 and
MULAB is not 0. No. of rows of the contrast coefficient
matrix is (MA-1)X(MB-1).Last Card

Processing ceases when a blank or an END OF DATA SET (/*) card is encountered where a title card for next job was expected. As many jobs as required may precede this blank card.

Special Considerations

(1) Since the accuracy of the program depends on the computation of the inverse of matrix $X'X$, $(X'X)^{-1}X'X$, which should be close to an identity matrix, is output to see the accuracy of the program.

(2) The overflow problem may be avoided by dividing every criteria or concomitant variable by a constant without affecting the inference.

(3) The assumptions of the homogeneity of dispersions and normality may be tested by MULV51 and MULV53 respectively, if some irregularities occur or there are some reasons to suspect violation of the assumptions.

Output

The following information is output by the program.

1. Criteria and design matrix (optional).
2. $X'X$ matrix denoted by AA.
3. Estimation of effects or parameter matrix, i.e., general mean vector, 'A' effect matrix, 'B' effect matrix, 'AB' interaction matrix, and regression coefficient matrix estimates.
4. Deviation product due to error or residuals before M transformation denoted by SE matrix.
5. $(X'X)^{-1}X'X$ to check the inversion computation.

Main Tests

The following is output for each M matrix.

1. Input M matrix and SE matrix after M transformation.
2. Test for 5 types of hypotheses described on page 2. For each hypothesis, C , deviation product matrix due to hypothesis denoted by SH is output, and Rao's approximate F-test using Wilk's Λ and Roy's maximum root tests are performed.

Multiple Comparisons

The following output is given for multiple comparisons of parameters if any of MULA, MULB, and MULAB is not 0.

1. Contrast coefficient matrix, and corresponding C matrix.
2. For each weight vector and for each row of contrast matrix, normalizing inter-parameter vector b , Rao's test, Roy's confidence intervals of the contrasts of parameters, and confidence intervals of Wilk's Λ .

ATTITUDE MEAN SCORES

	Informative	Interesting	Clear	Attractive	Exciting	Simple
Male	E 3.90909	3.87879	3.09091	2.90909	4.21212	2.21212
Industrial	N 3.57576	4.15152	2.66667	4.12121	4.51515	2.57576
Buyer	R 2.27273	3.66667	2.39394	4.15152	4.60606	2.42424
Female	E 5.57143	4.28571	5.85714	4.42857	4.85714	3.00000
Industrial	N 2.57143	4.14286	2.57143	3.42857	4.14286	3.00000
Buyer	R 2.28571	3.00000	2.00000	5.14286	4.14286	2.57143
Male	E 4.31579	3.68421	4.57895	2.05263	3.52632	3.31579
Ultimate	N 2.84210	3.42105	2.68421	3.84210	4.15789	2.73684
Consumer	R 2.26316	3.36842	2.26316	3.78947	3.94737	3.05263
Female	E 4.61905	3.71428	4.85714	2.61905	4.23809	3.57143
Ultimate	N 3.14286	3.95238	3.28571	3.09524	4.00000	2.38095
Consumer	R 1.80952	3.00000	1.95238	3.14286	3.71428	1.90476

E = Emotional Advertisement

N = Neutral Advertisement

R = Rational Advertisement

ATTITUDE MEAN SCORES

		Informative	Interesting	Clear	Attractive	Exciting	Simple
Industrial Buyer	E	4.200	3.950	3.575	3.175	4.235	2.350
	N	3.400	4.150	2.650	4.000	4.450	2.650
	R	2.275	3.550	2.325	4.325	4.525	2.450
Ultimate Consumer	E	4.475	3.700	4.725	2.350	3.900	3.450
	N	3.000	3.700	3.000	3.450	4.075	2.550
	R	2.025	3.175	2.100	3.450	3.825	2.450

E = Emotional Advertisement

N = Neutral Advertisement

R = Rational Advertisement